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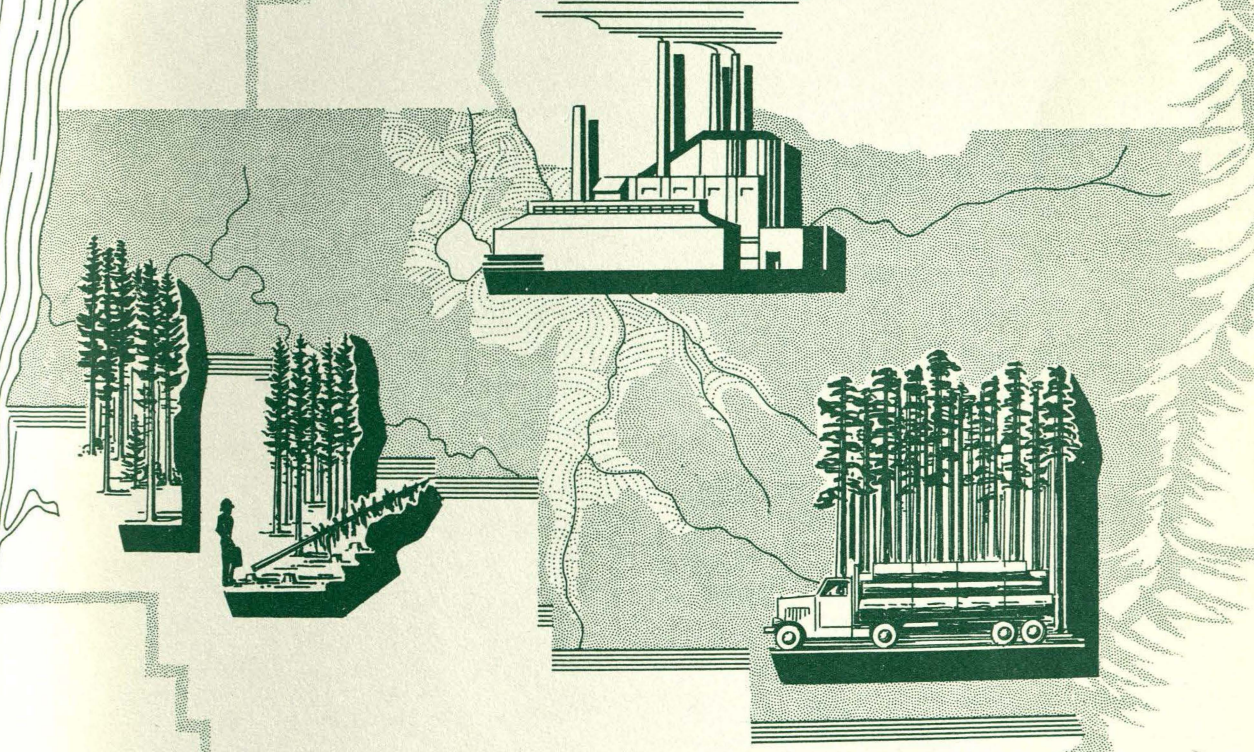
FOREST RESOURCES *and* FOREST INDUSTRIES of Lane County OREGON



PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION
R. W. COWLIN, Director

U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

Portland, Oregon

December 1957

Forest Survey Report 131

FOREST RESOURCES AND FOREST INDUSTRIES OF LANE COUNTY, OREGON

Division of Forest Economics Research

December 1957

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FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE

PREFACE

This is a consolidated report of the results of a reinventory of the forests of Lane County and of a number of special studies of forest uses. The reinventory and special studies were made in 1956.

The reinventory is a part of the Forest Survey, a nationwide project of the Forest Service authorized by the McSweeney-McNary Forest Research Act of 1928, amended in 1949. Purpose of the Forest Survey is to periodically inventory the extent and condition of forest lands and the timber and other forest products on them, to ascertain the rates of forest growth and depletion, to estimate present consumption of timber products, and to analyze and make available survey information needed in the formulation of forest policies and programs.

The Forest Survey in the Pacific Northwest region, composed of Oregon and Washington, is an activity of the Pacific Northwest Forest and Range Experiment Station. Under this program the forests of Lane County were inventoried first in 1932 and again in 1942. Results of the initial inventory and first reinventory were released through statistical publications and county forest type maps.

The special studies were made by the Experiment Station and were cooperatively financed through the Lane County Chamber of Commerce. Objectives of the studies were to determine present use of the forest resource for production of lumber, plywood, pulp, and other products; to evaluate the benefits of such use to the economy of the county; and to disclose opportunities for further expansion of forest industries. The studies also covered forest recreation, wildlife habitat, and the relation between forest lands and the water resource.

Acknowledgment is made of cooperation from the Oregon State Unemployment Compensation Commission and the State Forester of Oregon in making supplemental studies of the forest resource and forest industries.

One result of the 1956 Forest Survey reinventory is a revised forest type map of the county on scales of 1 and 2 inches to the mile. Prints of this map are available at cost of blueprinting. For information write Director, Pacific Northwest Forest and Range Experiment Station, P. O. Box 4059, Portland 8, Oregon.

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Highlights of the Forest Situation

LANE COUNTY'S FOREST RESOURCE--

Consists of a large acreage of forest land, much of it stocked with heavy stands of timber, and with the physical capability of growing successive crops of raw material for continuation of the large-capacity and varied forest industry that dominates the county's economy:

- FOREST LAND COMPRISES 87 PERCENT of the county's total land area of 2,958,000 acres.

- A TOTAL OF 2,420,000 ACRES, or 94 percent of the forest area, is classed as commercial forest land, i.e., physically capable of growing merchantable trees and available for such purpose.

- SAWTIMBER STANDS OCCUPY 1,720,000 ACRES, 71 percent of the commercial forest area.

- OLD-GROWTH STANDS--180 to 600 years or more old--stock two-fifths of the sawtimber acreage; young-growth stands--70 to 180 years--stock three-fifths.

- SMALL YOUNG-GROWTH TIMBER STOCKS a total of 630,000 acres. On 40 percent of the area the trees are poletimber size (5-11 inches d.b.h.); on 60 percent, they are seedling or sapling size (0-5 inches d.b.h.).

- FORESTS ARE PREDOMINANTLY DOUGLAS-FIR--on 88 percent of the stocked commercial forest land, this species comprises the major part of the stand, either by volume or number of trees. Pure stands are common over large acreages.

- LIVE SAWTIMBER VOLUME is estimated to total 97 billion board-feet, Scribner rule. This volume is contained in trees 11 inches d.b.h. and larger.

- NINETY-EIGHT PERCENT of the sawtimber volume is contained in 16 softwood species; 2 percent in 6 hardwood species. Four-fifths of the volume of all species is Douglas-fir.

- PRIVATE OWNERS--individuals, companies, and corporations--hold 37 percent of the commercial forest land and 22 percent of the sawtimber volume.

- INDUSTRIAL OWNERS with timber-processing plants have nearly two-thirds of the 903,000 acres of privately owned commercial forest land; nonindustrial owners have a third.

- THE FEDERAL GOVERNMENT HOLDS 62 PERCENT of the commercial forest land and 77.4 percent of the sawtimber volume; the State of Oregon holds 1 and 0.6 percents, respectively.

LANE COUNTY'S FOREST INDUSTRIES--

Consist of 141 sawmills, 19 green veneer and plywood plants, 1 pulp plant, 6 shingle mills, 8 planing and remanufacturing plants, 21 specialty or cut-up plants, 7 pole and piling yards, a number of wood-treating plants, and a centrally located wood-chipping plant.

- SAWMILLS PRODUCED 1.5 BILLION BOARD-FEET OF LUMBER--stationary mills, 98 percent; portable mills, 2 percent.

- GREEN VENEER PLANTS PRODUCED 626 MILLION SQUARE FEET (3/8-inch basis) of Douglas-fir veneer, and plywood production in the county amounted to 590 million square feet.

- ONE-AND-A-HALF BILLION BOARD-FEET OF LOGS (log scale, Scribner rule) was consumed by the sawmills, green veneer plants, and shingle mills. Eighty percent of this volume came from live timber; 20 percent, from dead timber.

- PLANT RESIDUE developed in the manufacture of lumber and plywood amounted to nearly 2 million tons, dry weight. Of this, 70 percent was utilized for pulp chips, small wooden items, and fuel; 30 percent was unutilized.

- FOREST INDUSTRIES WERE LARGEST EMPLOYERS in the county; they employed an average of over 13,000 persons with an annual payroll of 60 million dollars.

- VALUE OF FOREST PRODUCTS manufactured totaled 185 million dollars.

- OPPORTUNITIES FOR EXPANSION OF INDUSTRY lie in:
    1. A probable increase in annual cut allowable under sustained-yield management.
    2. Greater use of plant and woods residue.
    3. Use of hardwood and minor softwood species.
    4. More complete local processing of forest products.

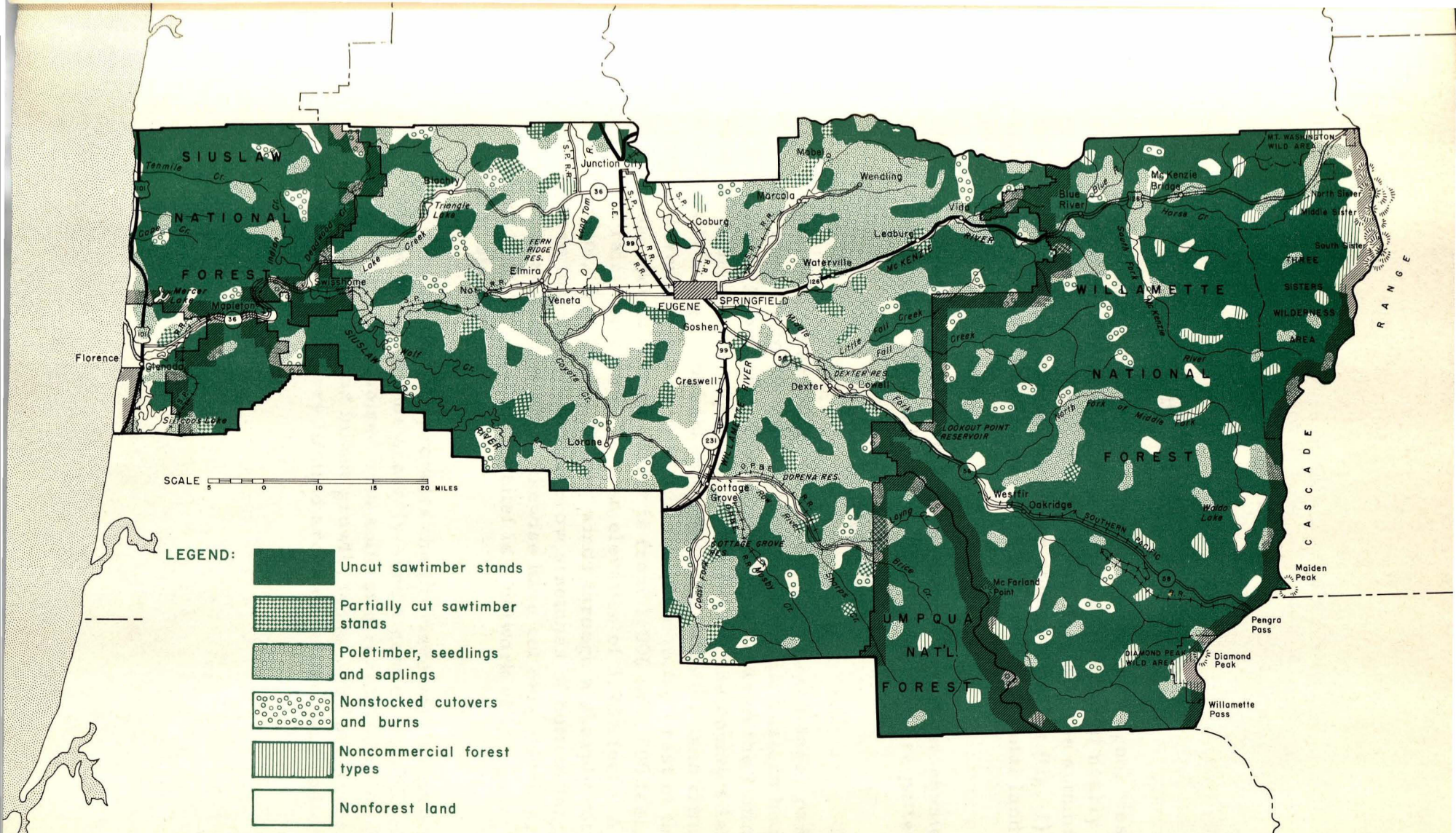


FIGURE 1--FOREST STAND-SIZE AND CONDITION CLASSES

LANE COUNTY, OREGON

1956

DESCRIPTION OF THE COUNTY

Lane County, one of the larger counties in Oregon, lies in the west-central portion of the State. From a frontage of nearly 30 miles on the Pacific Ocean, it extends eastward to the summit of the Cascade Range, a distance averaging about 115 miles (fig. 1). Its width north and south varies from 25 to 60 miles. Total land area is 2,958,000 acres.

Topographic features divide the county into three physiographic provinces in which physical factors dictate the land-use pattern.

COASTAL PROVINCE

A low-lying mountainous barrier, the Coast Range, parallels the coast some 30 to 40 miles inland to define the eastern boundary of the Coastal Province. The country lying between the summit of the range and the ocean comprises about a fifth of the county's land area. It is mostly a region of broken topography, with the land climbing gradually from a very narrow, coastal plain to the crest of the range. In general, elevation of the crest is from 1,000 to 1,800 feet; highest point is Prairie Mountain, with an elevation of 3,734 feet. A single main stream, the Siuslaw River, winds through a sharply cut valley in which are found only a few narrow stretches of bottom land. The many tributaries of the river likewise have cut deep courses, with the result that the province's relief is a network of irregular ridges and short, steep slopes.

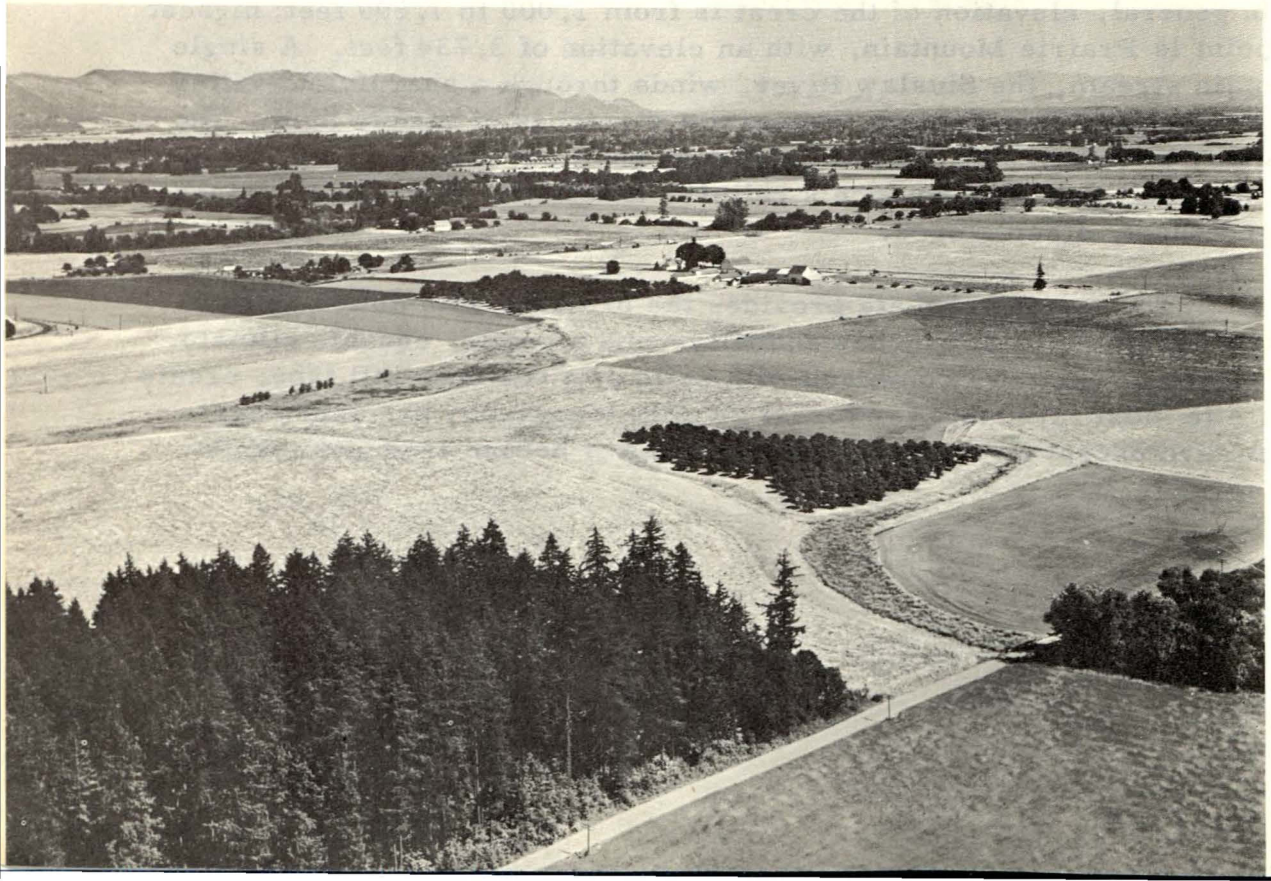
The marine climate provides the province with abundant rainfall--from 60 to 120 inches annually--and a gentle, equable climate. These two factors, combined with soils of a residual-hill type, create a site most favorable for forest growth; topography precludes agriculture except on the very limited areas of bottom land and coastal terrace.

WILLAMETTE VALLEY PROVINCE

The broad valley of the Willamette River, lying between the crest of the Coast Range on the west, and the foothills of the Cascade Range on the east, comprises a well-defined province. The southern boundary, the Calapooya Mountains, is a low mountainous spur that stretches between the Cascade and Coast Ranges and forms part of the upper perimeter of the Willamette Valley. Except along the western and southern boundaries, where short slopes drop from the Coast Range and the Calapooyas, the province consists of wide alluvial flats broken only by shallow meandering stream courses and a few minor buttes. Elevation of the valley floor is from 325 to 450 feet, that of the perimeter about 1,000 feet. The Valley Province contains almost a fifth of the county's land area.

Precipitation over the valley and lee slopes of the Coast Range varies from less than 40 inches to about 50 inches annually. Temperatures are variable but not extreme. Soils of the valley floor are alluvial; those of the slopes are residual-hill type. Physical conditions favor the growth of Douglas-fir over most of the province.

The central valley section of Lane County consists of a patchwork of forests and farms.



The first white settlers found Douglas-fir predominant. Black cottonwood and red alder occurred along the stream courses, and Oregon white oak formed compact stands on the drier sites. The settlers also found broad, treeless prairies in the valley; it is believed these areas were kept deforested by the Indians through burning to improve hunting conditions. During more than a century of white habitation, forested areas have been cleared until now some 260,000 acres are in agricultural use or in town or industrial sites. Present forest cover on the valley floor is largely small islands of woodlots; cover on the slopes is broken at times by cleared land.

CASCADE SLOPES PROVINCE

Roughly three-fifths of the county's area lies on the slopes leading from the eastern boundary of the valley floor to the summit of the Cascade Range. Physical conditions here are of such homogeneity that the area may be treated as a province.

Terrain in most of the province is rugged. It is characterized by deep canyons cut by the many tributaries of the Willamette River, steep slopes, and sharp ridge tops. Elevations climb from about 1,000 feet near the valley to a general level of 6,000 to 7,000 feet at the summit of the Cascades. Three peaks along the summit--the North, Middle, and South Sisters--rise to more than 10,000 feet. Increasing gradually with ascent of the general slope, precipitation varies from 50 to 120 inches per year. Variation in temperature is also appreciable due to the wide altitudinal range. Subalpine forest conditions prevail near the summit. Timberline in the vicinity of the Three Sisters is between 6,000 and 6,500 feet, above which are broad fields of lava, mountain barrens, and glaciers.

Physically, this province is a forest zone in which good forest management should result in not only greater timber production, but also greater production of wildlife, recreation, and water. Land clearing for agriculture within the province has been restricted very largely to the bottom lands along the lower stretches of the larger stream courses.

LAND CLASSIFICATION

Classification of the nearly 3 million acres of land (table 1) in the county finds 87 percent available for forest use--now supporting a forest stand or in a transitory nonstocked condition. Lands in

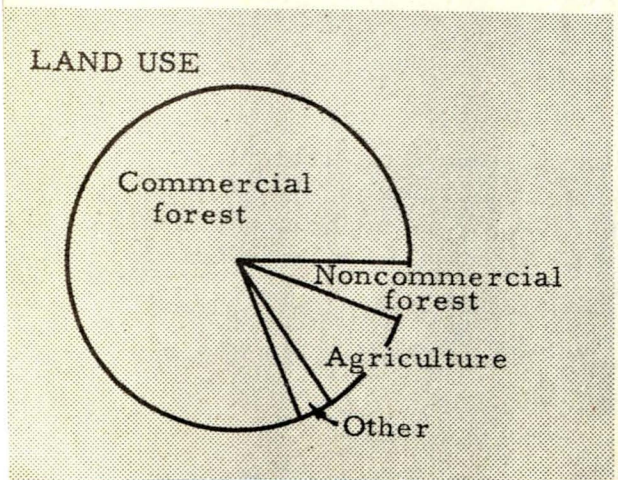
agricultural use, either cultivated or pastured, comprise 10 percent. Other nonforest land, including town and industrial sites, sand dunes and tideflats along the coast, unmeandered water, and high mountain barrens comprise the remaining 3 percent. The acreage in each land-use class is:

	Thousand Acres
Forest	2,576
Agriculture	302
Other	80
All land	2,958

FOREST LAND

The major use of forest land in Lane County is for production of crops of merchantable timber. However, other uses--such as for production of water and for wildlife habitat, recreation, and botanical and ecological study--are also important. With its more than 2.5 million acres of forest land, Lane County has large areas that can be managed for single uses. The acreage in each class of forest land is as follows:

	Thousand Acres
Commercial	2,420
Noncommercial:	
Productive-reserved	126
Unproductive	30
All forest land	2,576



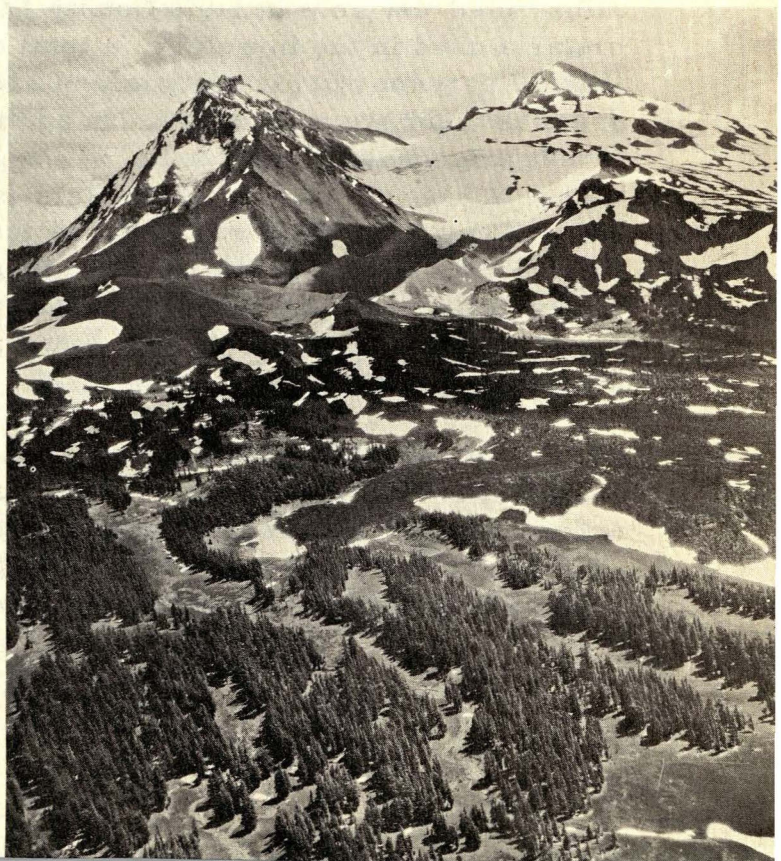
Commercial Forest Land

All but a little more than 1 percent (30,000 acres) of the county's forest land is capable of producing timber of commercial size and quality. Of the productive land total of 2,546,000 acres, 2,420,000 acres is available for growing timber crops. This land, classed as commercial forest land in the Forest Survey inventory, is the portion of the forest resource from which the county's forest industries will obtain their raw material.

Noncommercial Forest Land

A total of 126,000 acres of the productive forest land is presently reserved for purposes other than timber production, and no cutting is permitted. This acreage plus the 30,000 acres incapable of growing usable timber crops is classed in the inventory as noncommercial forest land.

The productive-reserved acreage includes 124,000 acres of national-forest land within three units lying along the summit of the Cascade Range. The largest of these, the Three Sisters Wilderness Area, retains natural conditions of the rugged scenic country surrounding four high peaks--North, Middle, and South Sisters, and Broken Top. The other two units, Diamond Peak Wild Area and Mt. Washington Wild Area, are smaller reservations of primitive conditions around prominent peaks.



The North and Middle Sisters are outstanding examples of scenic beauty within the Three Sisters Wilderness Area.

Several small State, county, and municipal parks, set aside for recreational use, include some 2,000 acres of productive forest area.

The productive land surrounding Waldo Lake in the Willamette National Forest is included in the commercial forest land acreage. This area is one of several in the national forests of Oregon and Washington that are classed as limited areas because of their outstanding scenic and recreational values. They will be managed as recreational areas until such time as a thorough study of land-use management can be made; meanwhile, road building and commercial timber cutting are prohibited unless personally approved by the Regional Forester. A study of land use is now under way in the Waldo Lake area, and upon its completion a recommendation will be made as to final classification. Prior to this decision, the productive-land acreage is considered in the forest inventory as unreserved.

The unproductive forest land consists of subalpine stands of dwarfed trees on high mountain areas just below timberline, sparse stands of trees of poor form on rocky sites within the commercial forest zone, and short, limby oak and madrone on especially dry sites of the Willamette Valley Province.

NONFOREST LAND

In comparison with timber growing, agriculture has a relatively minor land-use role in Lane County. In terms of land classification criteria used in the inventory, a total of 302,000 acres, a little more than 10 percent of the county's land area, is either in farm cropland, grass or unimproved pasture. In addition, some lands classed as forest are seasonally grazed.

Comparison of periodic statistics from the Census of Agriculture, U. S. Bureau of the Census, indicates a gradual reduction of agricultural use in recent years. Cropland in 1939 totaled 190,000 acres; in 1954, 158,000 acres. Land pastured showed a similar reduction in acreage.

The bulk of the agricultural land is on the valley floor of the Willamette Valley Province. Lesser concentrations of cropland occupy bottom land along the lower courses of the larger streams. Pasture lands extend a short distance up the foot slopes. Hay and small grains are the principal field crops, and some acreage is used

for vegetables and fruits. Dairying and raising livestock and poultry are also important sources of agricultural income. Value of all farm products sold in 1954 totaled $13,669,260. Forty-seven percent of this value was from crops, 43 percent from livestock and livestock products, and 10 percent from forest products.

A second class of nonforest land includes town and industrial sites, tidelands along the coast, and high mountain barrens. These lands total 52,000 acres A third class is the 28,000 acres of unmeandered water, the bulk of which is reservoirs formed in recent years by completion of several dams. A small portion of Waldo Lake lying in unsurveyed area is included. The unmeandered water area does not include the acreage of reservoirs that will be formed by dams now being constructed.

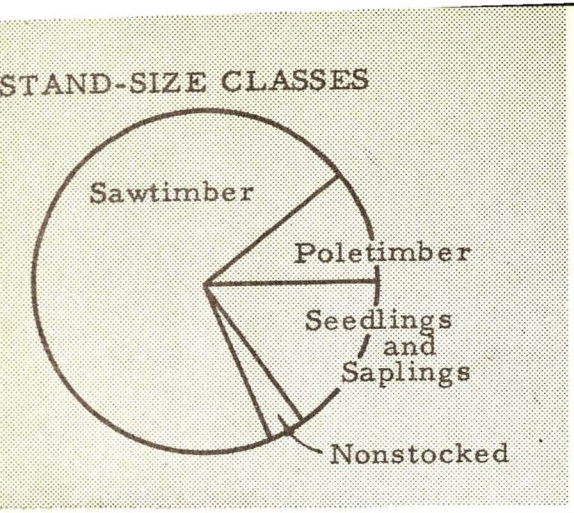
THE FOREST RESOURCE

The forest wealth with which nature so abundantly endowed the area that is now Lane County lies basically in the productive forest land. That the major part of this land is still stocked with heavy stands of mature timber of desirable species--after more than a century of ever-increasing rate of utilization--is most fortunate and a tribute to fire protection efforts. The greatest wealth potential, however, derives from the fundamental physical capability of the soil to grow succeeding crops of timber under forest management.

COMMERCIAL FOREST LAND

The forests that the first white settlers found covering all of the county's surface, except for relatively small open areas in the central valley, were largely dense stands of old-growth timber. However, throughout the county there were occasional, and at times fairly extensive, tracts of young stands that had naturally restocked burned-over areas; there were also areas in a nonstocked condition following recent fires. For example, the major part of the county lying between the Coast Range and the ocean was deforested by large fires that occurred about 1850, shortly after advent of settlement.

The broken pattern of the original forest cover, consisting of varying age classes and sizes of timber, has been made even more broken through the many decades of logging and land-clearing operations. These influences have affected the timber cover chiefly in the central part of the county--on the valley floor and surrounding



foothills and lower slopes. The inventory found the current timber occupancy of the commercial forest land to be:

Class	Thousand Acres
Sawtimber	1,720
Poletimber	257
Seedlings and saplings	373
Nonstocked	70
All classes	2,420

Sawtimber Stands

The sawtimber acreage is comprised of 1,639,000 acres of stands in which there has been no cutting and 81,000 acres of partially cut stands in which the sound volume in reserve trees totals 5,000 board-feet or more per acre, the minimum volume for sawtimber stands. The partially cut sawtimber stands are generally restricted to small tracts of a few hundred acres each (fig. 1).

On the basis of timber size, stands on 1,352,000 acres (four-fifths of the total sawtimber area) were classed as large--trees 21 inches d.b.h. and larger. Stands on 368,000 acres (one-fifth of the sawtimber area) were classed as small--trees from 11 to 21 inches d.b.h. The acreage of large sawtimber is roughly divided equally between old-growth stands more than 180 years old and young growth from about 40 to 180 years old. Most of the old-growth sawtimber area is stocked with large-diameter Douglas-fir, the so-called "yellow fir." Likewise, a very large part of the area of large young-growth sawtimber is occupied by Douglas-fir, commonly known as "red fir" in this form.

Approximately 97 percent of the sawtimber acreage supports stands in which softwood species predominate on a volume basis; 3 percent supports stands in which hardwood species predominate.

Poletimber Stands

Approximately four-fifths of the 257,000 acres of poletimber stands is located in the central part of the county--in the Willamette Valley and surrounding foothills to the west and east. The other fifth is divided between stands in the coastal province and those on the higher elevations of the Cascade slopes province.

Most of the stands in the central part are Douglas-fir that has naturally restocked lands clear cut during the first two decades of the present century. Stands in the coastal area are chiefly red alder; there are small areas of western hemlock and Sitka spruce. As a rule, these stands restocked burns. The major part of the poletimber acreage on the upper slopes of the Cascades is occupied by lodgepole pine. Mixed stands of mountain hemlock and true firs cover a minor part of this high elevation area.

Seedling and Sapling Stands

The seedling and sapling stands, like those of poletimber size, are located largely in the central part of the county on areas that were logged during the past two or three decades. Douglas-fir is the key species in stands on 332,000 acres--89 percent of the total acreage of this size class of timber. Red alder predominates on some 33,000 acres, chiefly in the coastal section. Western hemlock stocks nearly all of the remaining acreage.

Nearly 40 percent of the sawtimber acreage in Lane County is stocked with large, high-quality, old-growth Douglas-fir, which comprises a reservoir of peeler-grade logs for the growing plywood industry. (Photo by Moderne Studios.)

Well-stocked seedling, sapling, and poletimber stands assure ample future supplies of raw material for Lane County's forest industries.

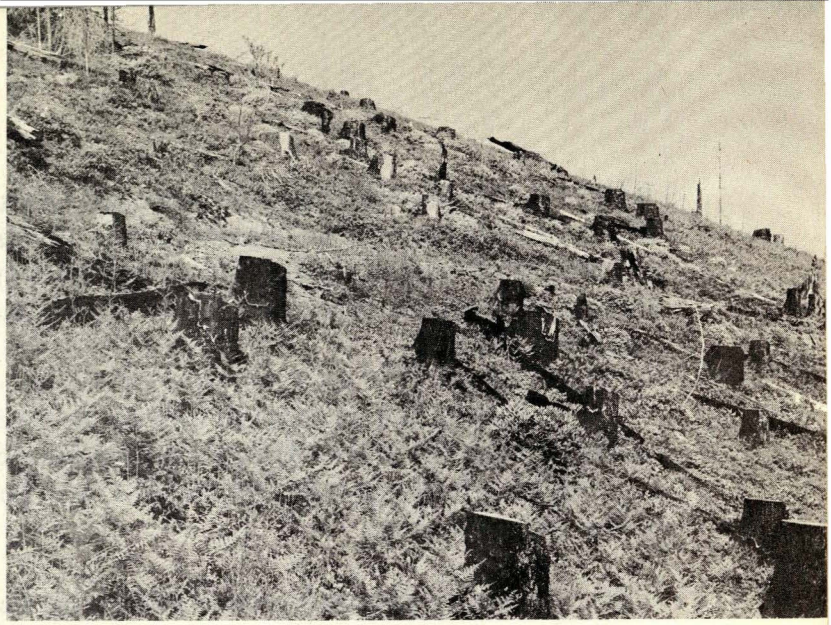
Nonstocked Area

Lands currently in a nonstocked condition amount to 70,000 acres, about 3 percent of the total commercial forest area. However, 61,000 acres is recently clear-cut land that has had only a few years in which to become stocked, and chances are good that most of the acreage will reforest naturally. Six thousand acres of older cut-over land may not restock readily because of competition from a cover of brush and weeds. There is about 3,000 acres of deforested burns that may also be slow in restocking because a brush cover has become established.

Stocking of Young-Growth Stands

Another measure of the county's present timber inventory, and particularly one that indicates the character of future timber crops, is a classification of stocking density of young stands under about 160 to 180 years old:

	Well stocked (M acres)	Medium stocked (M acres)	Poorly stocked (M acres)
Large young-growth sawtimber	599	13	1
Small young-growth sawtimber	335	33	1
Poletimber	179	72	6
Seedlings and saplings	136	173	64
Total	1,249	291	72



Restocking on some 6,000 acres is hindered because of lack of seed supply and competition from cover of brush, weeds, and bracken fern.

If, as is sometimes done, the well- and medium-stocked classes are combined into a category known as "satisfactory" stocking, the situation is most favorable--more than 95 percent of the young-growth timber acreage is in that category. In classifying the stocking of young-growth stands, all commercial tree species of all sizes are considered; i.e., a young-growth sawtimber stand may be classed as well stocked on the basis of sawtimber-size trees, poletimber, seedlings and saplings, or any combination of these tree sizes. Details of the stocking classification are shown in table 2.

FOREST TYPES

That Lane County is a most favorable habitat for Douglas-fir is emphasized by a classification of present timber stands by forest type--a classification in which the criterion is predominance of a species in the stand, based on cubic volume in the case of sawtimber and poletimber stands and on number of trees in seedling and sapling stands. The Douglas-fir type covers 88 percent of the 2,350,000 acres of stocked commercial forest land:

Forest Type	Thousand Acres	Percent
Douglas-fir	2,064	88
Western hemlock-Sitka spruce	25	1
True fir-mountain hemlock	134	6
Pines	21	1
Hardwoods	106	4
Total	2,350	100

Half of the acreage of western hemlock-sitka spruce type is found in the Coastal Province and is stocked with both pure and mixed stands of both species; the other half is located on the middle slopes of the Cascade Range and is stocked with stands of western hemlock only.

The true fir-mountain hemlock type is located on the upper slopes of the Cascade Range and is composed of both pure stands and various mixtures of Pacific silver fir, noble fir, subalpine fir, and mountain hemlock.

About 83 percent of the pine type acreage is covered with pure lodgepole pine on the upper slopes and ridges near the summit of the Cascade Range; 11 percent consists of scattered small areas of ponderosa pine on the foothills of the central valley; the remaining 6 percent is small areas of western white pine on the Cascade slopes.

The hardwood type in Lane County consists largely of red alder stands, chiefly in the Coastal Province.

Statistical information on areas of major and detailed local forest types is given in tables 3 and 4.

TIMBER SUPPLY

A major phase of the forest situation appraisal in Lane County included estimation of quantity of merchantable timber now stocking the commercial forest land and estimation of the quantity of raw wood material--woods and plant residues--presently being made available through the harvesting and processing operations of forest industries. The volume of sound live timber represents a primary source of raw material and its estimation was a function of the re-inventory. Residues are a secondary source of industrial raw material and the estimation of their volumes was the objective of supplemental studies.

Live Sawtimber Volume

The sound volume of live sawtimber trees (11 inches d.b.h. and larger) on commercial forest land is estimated to total 97,010 million board-feet, log scale, Scribner rule. Expressed in terms of the International 1/4-inch rule, the volume is 103,743 million board-feet.

All but three-tenths of 1 percent of the volume is contained in sawtimber stands; the remainder is contained in occasional sawtimber trees in poletimber and seedling and sapling stands or on nonstocked areas (table 5).

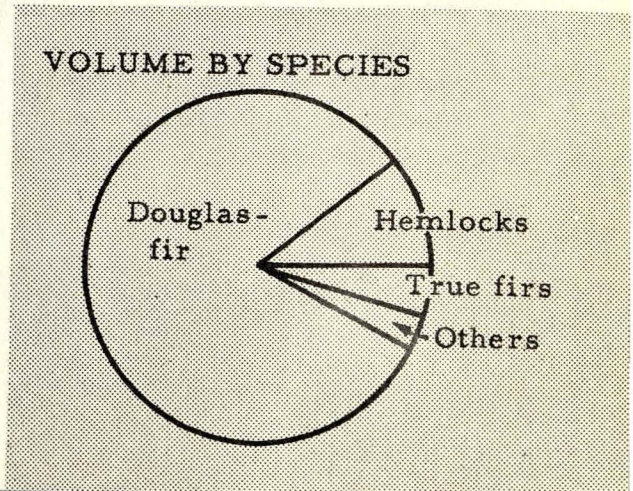
Sixteen softwood species, recognized as of commercial quality and use, have a combined volume of 95,349 million board-feet (Scribner); volume of six hardwood species totals 1,661 million feet (table 6). Four-fifths of the volume of all species is Douglas-fir.

Western hemlock, mountain hemlock, western redcedar, and the true firs are species present in appreciable quantities. About two-thirds of the hardwood volume is red alder, and nearly all of the remainder is bigleaf maple.

The predominance of large old-growth Douglas-fir in the county becomes apparent in a grouping of the volume by 10-inch diameter classes:

	Douglas-fir (Percent)	Other softwoods (Percent)	Hardwoods (Percent)
11.0 - 20.9	11	28	80
21.0 - 30.9	21	36	17
31.0 - 40.9	22	22	2
41.0 +	46	14	1
Total	100	100	100

Diameter class distribution of some of the other principal softwoods is shown in table 7.



Growing Stock Volume

Another measure of the sound live timber resource is estimation of cubic-foot volume of growing stock--all live trees 5.0 inches d.b.h. and larger, including both poletimber and sawtimber trees. This volume is estimated at 17,384 million cubic feet (table 8). Nearly 99 percent of the volume is in sawtimber stands, and the bulk of the remainder is in poletimber stands (table 5). Seventy-five percent of the growing-stock volume is Douglas-fir.

Salvable Woods Material

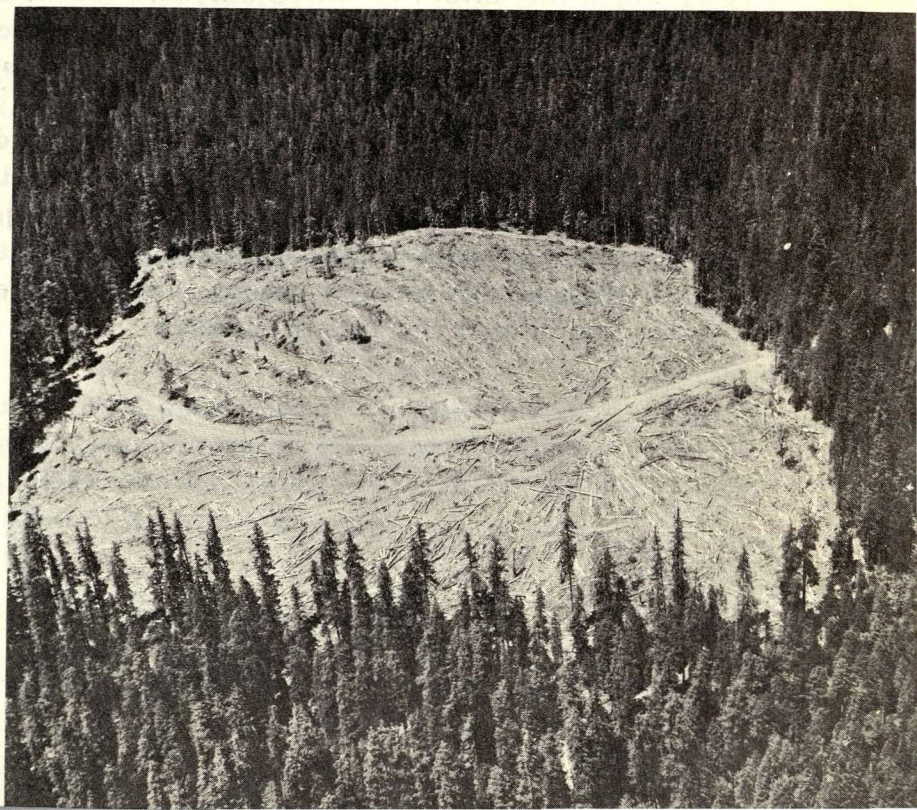
An important secondary source of raw material for the county's forest industries is the volume of salvable wood made physically accessible annually through logging operations. This material, variously known as logging "waste" or "residue," consists of dead and down timber, cull trees, and cull logs. It is chiefly a by-product of timber harvesting operations where the primary objective is production of merchantable logs of conventional lengths and diameters.

Salvable material can be sound wood contained in broken or otherwise severely damaged live standing trees; in tops of felled and bucked trees above the last log cut; in broken chunks of the bole; in small-diameter, spindly, suppressed trees; and in parts of snags, windfalls, live cull trees, and bucked cull logs. It can also be defective wood for which there is a present or potential industrial use in the manufacture of marketable products. An example of utilizable defective wood is old-growth Douglas-fir timber in the earlier stages of decay caused by a conk rot, Fomes pini, commonly known as "white speck" or "white pocket" decay. There is a considerable volume of this defective timber in the eastern part of the county.

Logged areas on which salvable material has been made available through road construction in connection with a primary logging operation include (1) first-cutting areas that were logged in recent years and have not been relogged and (2) early-cut areas recently relogged. First-cutting areas have generally been clear cut to remove old-growth or large young-growth stands of sawtimber. A total of 29,000 acres was reported logged by first-cutting operations in 1955.

In Lane County, relogging--a timber-harvesting term of rather recent usage--includes either a "cleanup" of economically salvable material on a recently clear-cut area, or the examination and harvesting of material on older cutover areas, particularly those logged in partial-cutting operations. On some of the lower slopes of the county initial operations 20 to 40 years ago removed only the merchantable timber of unquestionable quality. Trees suspected of containing any appreciable amount of defect in the lower part of the bole were left unfelled. Since logging, some of these culled trees have died or blown down; others still stand. Material in such timber--in the heartwood of snags and windfalls and in sound segments of standing live trees--often comprises a worthwhile logging chance during periods of better log markets. Additional material is frequently available in the older cutovers in the form of clusters or scattered trees of young-growth sawtimber that was poletimber at time of initial logging. Relogging operations were reported to have covered a total of 47,000 acres in 1955.

A sampling survey of both first-cutting and relogged areas of 1955 was made in the fall of 1956 to obtain an estimate of sound merchantable material that could be salvaged. The material was classified for highest potential use as peeler block, saw log, or pulpwood. Volume of material classed as peeler block and saw log was measured in board-feet, log scale, Scribner rule, and also in cubic feet in case it might be used for pulp; volume classed as pulpwood was measured only in cubic feet. White-speck, defective material--



Salvable wood material on a recently clear-cut staggered setting.

considered merchantable for utility and economy grades of lumber, for sheathing and nonstandard grades of interior plywood, for decorative plywood and panels, or for pulp chips--was classified for highest possible use (table 9).

All of the material classed as peeler block was Douglas-fir, and the bulk of it was suitable for the lower grades of plywood. Of that classed as saw log, 83 percent was Douglas-fir, 3 percent western hemlock, 13 percent western redcedar, and 1 percent hardwood species--red alder and bigleaf maple. Douglas-fir comprised 84 percent of the total cubic volume, western hemlock 4 percent, western redcedar 10 percent, and the hardwood species 2 percent. Whereas various fungi cause the bulk of defective material in Douglas-fir, defect in western redcedar is due chiefly to worm holes.

In order to appraise economic operability, average size was determined for each of the three classes of material:

	Net volume of average piece	
	(Board-feet, Scribner)	(Cubic feet)
Peeler block	1,675	215
Sawlog	153	24
Pulpwood	--	6

Variation in size of pieces of material influences logging, loading, transportation, and milling. As a result, it determines pretty much the extent to which salvable material is utilized. In fact, wide variation in size has largely prevented more complete utilization in the woods, particularly on relogged areas.

Material classed as pulpwood was grouped into length classes as a further indication of operability. In choosing limits of these classes, type of truck transportation was a major consideration; short "8 feet and under" pieces would have to be hauled on flat-bed trucks. Percentage of total volume and average size was determined for each of three length classes:

	Percentage of volume of material in class (Percent)		Net volume of average piece (Cubic feet)
8 feet and under	25		3
9 - 24 feet	44		5
25 feet and over	31		15
Total	100	Average	6

Salvable material should be removed promptly after the primary logging operation; though not a necessity, early recovery is more productive and more efficient. On most recently clear-cut areas, slash burning, generally done the following fall, may hinder relogging. Small pieces may be consumed and the exterior of large pieces so charred that it is difficult to judge merchantability without considerable exploratory bucking. Also, fire-charred material is not acceptable as pulpwood. On relogged areas where removal of material is often spotty, broadcast burning is usually not practiced. Instead, heavy concentrations are spot burned, a practice that does not affect merchantable material on unsalvaged or unburned parts of the tract.

Prompt relogging is also desirable from the standpoint of early use of logging roads to and through the tract, before they deteriorate. Utilization of salvable material on areas suitable for tractor logging is far more feasible than on rough ground.

Plant Residue

The manufacture of lumber or plywood from logs is necessarily accompanied by a volume of wood not usable for the final product. Almost half of the original log volume is not used in converting round logs to products that are either rectangular in form or are sheets of fixed size. This volume of wood not used for the final product is large--Lane County in 1952 produced a greater volume of plant residue, in board-foot equivalent, than was cut for saw logs in 36 of the 48 States.

Plant residue must be disposed of to maintain orderly manufacturing processes and prevent clogging of plant facilities. It can be used for fuel, pulp, fiberboard, small wood parts, agricultural purposes, or be disposed of as a nuisance.

The demand for logs in the county has made necessary fuller utilization of residue wood in order for mills to remain competitive. The trend towards greater utilization of residue is demonstrated by statistics of the rising volume of residue put to useful purposes and is visible in the decreased number of burners and the decreased volumes going to many of the remaining burners.

Residue is usually classified according to size of material. Size is important because it often determines what use may be made of the residue. Coarse residue consists of larger pieces of wood and includes slabs, edgings, and trim developed in the manufacture of lumber, and peeler cores and veneer clippings developed in the manufacture of plywood. Fine residue consists of sawdust and shavings. In addition to the residue of wood, processing of logs also results in a large volume of bark residue.

The total volume of residue from sawmills varies according to the type of mill, products sawn, and size and quality of logs consumed. Mills equipped with circular saws produce more sawdust than bandsaw mills because of the greater thickness of circular saws. Gang sawmills convert logs to lumber with a smaller output of residue than other types of mills. Large mills usually produce a smaller volume of coarse residue than small mills because of the former's remanufacturing facilities. Sawing of smaller sizes of lumber--such as boards or dimension, compared with structural--results in a greater production of residue.

In the manufacture of green veneer and plywood, residue is developed at several points. The residue of greatest potential value are the cores, which remain after the log has been peeled, and the green veneer trim resulting when defect is clipped from the ribbon of veneer. Other residue consists of (1) log trim resulting from cutting logs to proper lathe length, (2) roundup from shaping logs to cylinders so that continuous strips of standard-width veneer are obtained, and (3) the dry-end residue of sander dust, panel trim, and breakage developed in the manufacture of plywood panels.

Studies at sawmills of various types and sizes and at veneer-plywood plants show that in utilizing a whole log the following percentages of primary product and residue, on the basis of dry weight, result:

	Sawmills (Percent)		Veneer-plywood plants (Percent)	
Primary product	(Lumber)	44	(Plywood)	46
Residue:				
Coarse		20		19
Fine		23		22
Bark		13		13
Total		100		100

Tables 10 and 11 give greater detail on recovery of residue items.

A field survey of all known sawmills and green veneer and plywood plants in the county was made in 1956 to obtain information on the total volume of plant residue developed and utilized in 1955. The amount of residue was expressed in thousands of tons, bone-dry weight, which is a commonly used unit.

Sawmill Residue

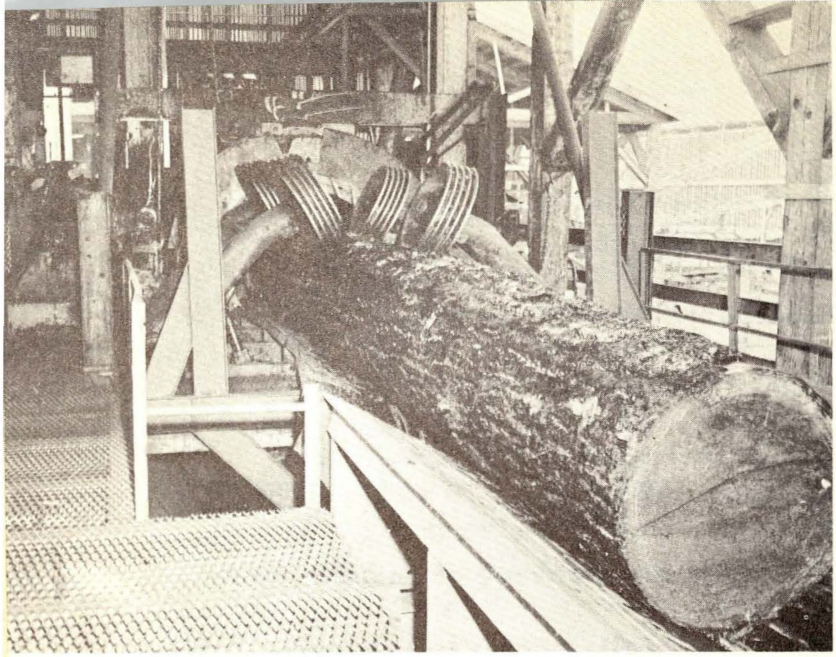
In producing approximately a billion and a half board-feet of lumber during 1955, the sawmills developed a total of 1,695,000 tons of wood residue and 433,000 tons of bark. Development and utilization of wood residue was as follows:

	Volume--thousand tons, dry weight		
	Developed	Utilized	Unutilized
Coarse	977	643	334
Fine	718	481	237
Total	1,695	1,124	571

Sawmills of capacity class 120 M b.m. and larger (8-hour shift) developed 52 percent of the total wood residue, 15 percent came from mills capable of sawing 80-119 M b.m., mills in the 40-79 M b.m. class accounted for 25 percent, and the remaining 8 percent came from mills with capacities of less than 40 M b.m.

Detailed information on volumes of residue developed, utilized, and unutilized by mills of the four capacity classes is shown in table 12.

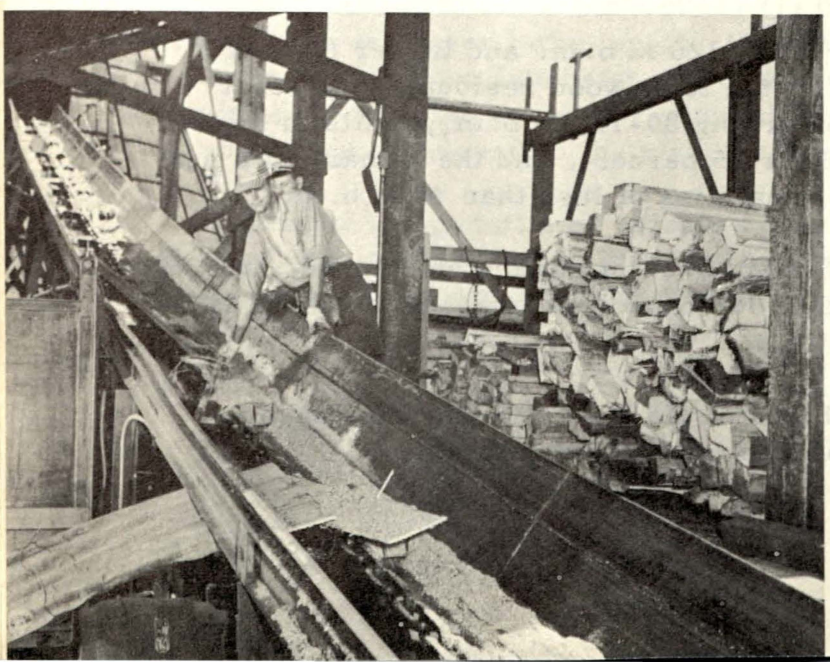
Approximately two-thirds of the wood residue developed in lumber manufacture in 1955 was utilized, as follows:



Log barkers enable better utilization through increased lumber-grade recovery and through output of a greater volume of residue material suitable for pulp chips. (Photo by Moderne Studios.)

	Percentage of residue volume
Pulp	16
Small wooden items	1
Agricultural	1
Fuel	48
Total utilized	66

Residue used for pulp was coarse material--chiefly slabs--converted to chips. About 84 percent of the 275,000 tons of pulp chips came from mills of the largest size class. As these mills produce only 59 percent of the total coarse residue, other factors than volume available for chipping caused this large percentage. The principal factor appears to be plant size. Six of the 11 mills in the



Clean wood is picked from the burner conveyor in the smaller sawmills not equipped with barkers and sold to central chipping plants.

class produce chips. These mills are commonly in a better position to invest the large sums required for barking and chipping equipment. The volume of residue suitable for chipping that can be recovered from barked logs is almost double the volume that can be recovered from unbarked logs. When markets for low-grade lumber are poor, residue volume is greater and more of it is chipped. In 1955, five of these mills had barkers and chippers and three had chippers only. Several other mills revealed plans to add either one or both of these two pieces of equipment. Installation--present or planned--of barkers and chippers, grouped according to the four mill sizes used in the inventory, is as follows:

	Barker		Chipper	
	Present	Planned	Present	Planned
120+ M	5	3	8	1
80 - 119 M	-	3	1	5
40 - 79 M	-	5	1	7
0 - 39 M	-	1	1	1
Total	5	12	11	14

None of the mills of less than 120 M capacity had barkers and only three had chippers in 1955. Common practice among these smaller mills was to pick clean wood--sound and bark free-from the burner conveyor and sell it to a central chipping plant in Eugene, operated by the Longview Fibre Company. Because of transportation costs, mills more than 20 to 30 miles from the chipping plant are unable to sell residue material for chips. Another factor that limits the output of chips from the smaller mills is the relatively small volume of clean wood available at an individual mill, generally a volume insufficient to warrant utilization.

The manufacture of small wooden items such as lath, handle stock, and molding, used 21,000 tons of coarse residue, most of it slabwood. Such material does not have to be bark-free when it comes from the sawmill as the bark is removed in manufacture of product.

Agricultural use includes sawdust and shavings for mulching material, as a soil conditioner, and for bedding for livestock and poultry. Such use consumed 18,000 tons.

The burning of slabs, edgings, trim, sawdust, and shavings as fuel has long been the major use of residue material from

sawmills. A total of 810,000 tons was so consumed in 1955. Most of the coarse residue used for fuel was consumed by individual mills for power. A number of mills not only generated their own power but sold surplus electricity. Other appreciable volumes of residue were sold for industrial and institutional fuel in the form of hogged fuel and sawdust. Sawdust and mill ends were used for domestic fuel by a large number of homes in the county.

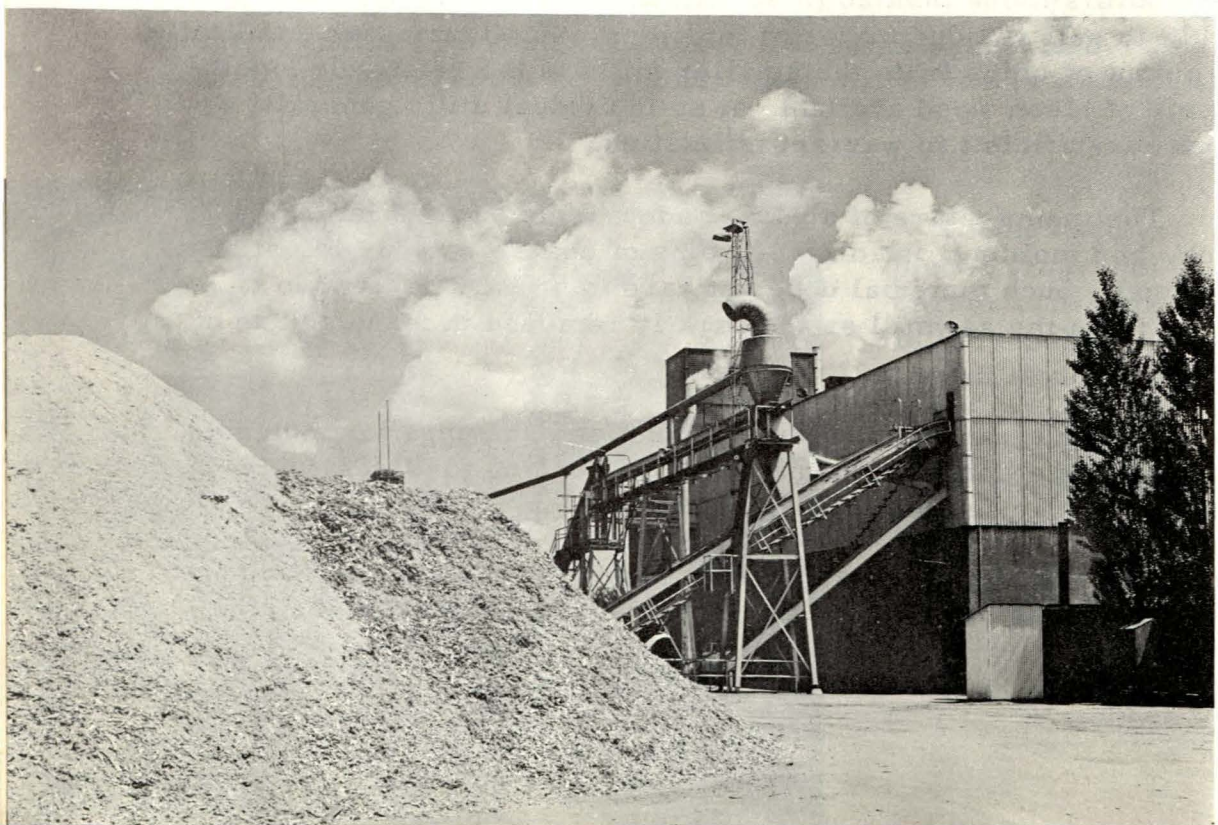
Veneer and Plywood Residue

Residue from the manufacture of green veneer amounted to 186,000 tons in 1955. Nineteen percent of this residue was in the form of cores, 56 percent was green veneer trim, and 25 percent came from roundup and log and spur trim.

Only 9 percent of the volume of cores was unused. Of the core volume utilized, 53 percent was converted to lumber, 34 percent used for pulp, and 13 percent sold for fuel. Eighty-seven percent of the 105,000 tons of green veneer trim was used, largely for pulp; some was burned as fuel. Residue from roundup and log and spur trim amounted to 46,000 tons, of which none was used.

Four of the 13 plants producing green veneer chipped cores, whereas 8 of the plants had veneer chippers. Two plants were

Hog fuel and sawdust from local sawmills heat the University of Oregon.



planning to install core chippers and four plants, green veneer chippers.

In the manufacture of plywood, 75,000 tons of dry-end residue was produced. The disposition of this residue was not determined; its principal use is for fuel. The volume of green-veneer and plywood residue developed and utilized in 1955 is shown in table 13.

Other Plant Residue

In addition to the residue from sawmills, an additional 20,000 tons of shavings was produced by custom planing mills.

Shingle mills produced 5,600 tons of coarse residue and 8,100 tons of fine residue. Some of this residue was used as shingle tow for packing nursery stock and as bedding material for poultry and dog kennels.

FOREST GROWTH AND MORTALITY

An analysis of the forest resource should include not only the extent and character of the timber supply and the rate at which it is being depleted through harvest and mortality, but also an estimate of the present and potential rates at which it is and will be replenished through growth.

In the calculation of estimated rates of present and potential growth, the county was divided into two units: (1) The Coastal Province, which includes the area lying between the Pacific Ocean and summit of the Coast Range; and (2) the remainder of the county, which includes the Willamette Valley and Cascade Slopes Provinces.

The Coastal Province is an area of high forest productivity. On the basis of a five-site classification designed to judge an area's productivity in growing Douglas-fir and in which class I is the most productive, the bulk of the forest land here rates as site-quality class II; most of the remainder of the province is class I. Another factor influencing the decision to make this area a separate growth unit is that it is presently stocked very largely with immature stands near the age of maximum growth rate. Three-fourths of the commercial forest acreage is occupied by young-growth sawtimber stands of softwood species, chiefly Douglas-fir, from 40 to 120 years old. Average age is about 80 years. The remaining one-fourth is stocked

with young-growth red alder sawtimber, softwood and hardwood poletimber, saplings and seedlings, and a relatively small acreage of mature sawtimber.

Productivity of the commercial forest land on the central valley floor and on the foothills and lower slopes of the eastern part of the county generally rates as site class III, the average and predominant class for the Douglas-fir subregion of western Oregon and western Washington. Within this class III zone, there is considerable acreage in class II and occasional small areas of class I. With ascent of the slopes leading to the summit of the Cascade Range, class III gives way to class IV, which in turn gives way to class V, the lowest in productivity and found on thin rocky soils of upper slopes and high ridge tops.

Of the area of sawtimber stands in this growth unit, totaling 1,472,000 acres, only one-fourth is occupied by stands under 110 years old; the other three-fourths is stands from 120 to 600 years old. As there is a gradual decrease in growth rate with increase in stand age, the large proportion of sawtimber acreage in the older stands materially influences the volume of net annual growth in this part of the county. For example, the growth rate for stands from 120 to 300 years old, which occupy about three-eighths of the sawtimber acreage, may be as much as 25 percent less than the average annual rate for young stands under 120 years; the rate in stands from 300 to 600 years, occupying the remaining five-eighths of the acreage, may be as much as 60 percent less than the rate for the young stands.

The growth estimate was calculated for two broad groups of forest ownership--private and public. Included in the public group were State lands and Federally owned Bureau of Land Management and national-forest lands.

Net Annual Growth

Estimated net annual growth on sawtimber trees (11.0 inches d.b.h. and larger) now occupying the commercial forest land of the county amounts to 460 million board-feet (Scribner).

An estimate of present net growth on all trees 5.0 inches d.b.h. and larger, including both poletimber and sawtimber, was calculated to be 60 million cubic feet per year.

The board-foot and cubic-foot net annual growth volume by ownership group and geographic unit of the county is as follows:

	Sawtimber trees (Million bd. -ft.)[1]	Poletimber and sawtimber trees (Million cu. ft.)
Coastal Province:		
Private	22	3
Public	172	22
Total	194	25
Remainder of county:		
Private	63	8
Public	203	27
Total	266	35
County total:		
Private	85	11
Public	375	49
Total	460	60

1/ Scribner rule.

Growth volume on the privately owned lands is low in comparison to that on public lands since much of the private acreage has been logged and is now stocked with seedling and sapling stands on which growth is not measured. The difference in growth volume between the two ownership groups will gradually lessen as young timber in private ownership reaches measurable growth size and public sawtimber is cut.

Potential Annual Growth

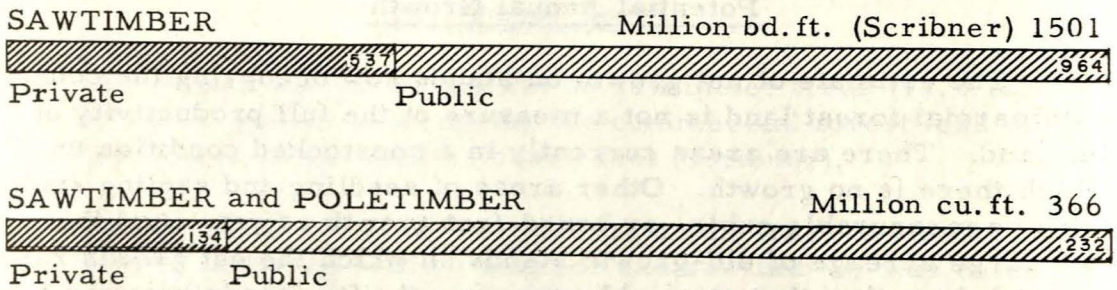
The estimate of net growth on stands now occupying the county's commercial forest land is not a measure of the full productivity of the land. There are areas currently in a nonstocked condition on which there is no growth. Other areas of seedling and sapling stands have no measurable cubic- or board-foot growth as yet. And there is a large acreage of old-growth stands on which the net growth rate is much less than that attainable on young thrifty stands near the age of maximum growth rate.

In order to determine the volume of growth that might be possible when the present stands of old-growth sawtimber are replaced by young stands and the nonstocked acreage is reforested, another form of growth estimate--known as potential annual growth--was calculated.

In calculating the potential growth estimate, it is assumed that all of the commercial forest area in the county is stocked with young-growth stands ranging from 1 year old to an average rotation age--100 to 110 years, depending on productivity of the land and desired forest products. Rotation age may be as short as 30 to 40 years for hardwood pulpwood or sawlogs, 50 to 70 years for softwood pulp material, and 70 to 100 years for softwood sawlogs; it may be as long as 150 years or more for softwood veneer logs.

Equal distribution of all age classes of the young stands is a requirement in the calculation. A further assumption is that these young stands of the future will grow at rates comparable with the rates at which the present stands on the commercial area grew. In other words, such stands will be of similar densities of stocking and will be subjected to similar depleting experiences such as suppression mortality, insect and disease attacks, ice and storm damage, and windthrow. However, instead of the mortality volume being unused, as in most of the present stands, it will all be harvested in future managed forests. Such a potential growth estimate is conservative in that it does not assume full stocking of all future stands, a requirement that would be hard to achieve over a large forest area and within a reasonable period of time.

Potential annual growth volume on sawtimber trees, under above conditions, is estimated at 1,501 million board-feet (Scribner);



on poletimber and sawtimber trees, the volume is estimated at 366 million cubic feet. A breakdown of these estimates follows:

	Sawtimber trees (Million bd. -ft.)[1]/	Poletimber and sawtimber trees (Million cu. ft.)
Coastal Province:		
Private	58	11
Public	236	46
Total	294	57
Remainder of county:		
Private	479	123
Public	728	186
Total	1,207	309
Total for county:		
Private	537	134
Public	964	232
Total	1,501	366

1/ Scribner rule.

Mortality

Mortality is the loss of timber volume through death of trees due to fire, attack by forest insects, infection by tree diseases, natural stand suppression, or felling by wind.

A sampling survey of the mortality volume that occurred during the 5-year period mid-1951 to mid-1956 was conducted in connection with the inventory work. This survey showed the average annual volume of sawtimber mortality to have been 670 million board-feet (Scribner). The annual rate of growing-stock mortality was found to have been 121 million cubic feet. These average annual mortality rates were undoubtedly greater than those covering a greater period of time. This was due to the large loss of timber caused by a particularly severe windstorm in December 1951 and subsequent attack by the Douglas-fir bark beetle (Dendroctonus pseudotsuga, Hopk.) on the wind-felled timber in 1952 and on nearby live timber during 1953.

Mortality volumes by ownership and geographic unit of the county were as follows:

	Mortality of Sawtimber trees (Million bd. -ft.) 1/	Mortality, poletimber and sawtimber trees (Million cu. ft.)
Coastal Province:		
Private	19	3
Public	146	24
Total	165	27
Remainder of county:		
Private	120	21
Public	385	73
Total	505	94
County total:		
Private	139	24
Public	531	97
Total	670	121

1/ Scribner rule.

FOREST OWNERSHIP

Determination of ownership of commercial forest land and estimated volume of timber on the land was an important phase of the reinventory. An analysis of the pattern of private forest ownership was one of the supplemental studies.

There are only two major classes of forest owners in the county--private and the Federal Government. Roughly three-eighths of the commercial forest land is in private ownership; five-eighths is publicly owned. A very large part of the public area is federally owned as national-forest land, administered by the Forest Service, or as revested-grant and public-domain lands, administered by the Bureau of Land Management; the State of Oregon owns 1 percent of the total acreage (table 14). Ownership of the live sawtimber volume is somewhat different--a little more than a fifth is privately held, only about six-tenths of one percent is State owned, and the remainder is federally owned (table 15). The ownership pattern is as follows:

ERRATA

Forest Resources and Forest Industries
of Lane County, Oregon
(December 1957)

Page 29; under Private Ownership, line 4: For 2,373 read 21,373.

Pacific Northwest Forest & Range Experiment Station
U. S. Department of Agriculture
Forest Service

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Province, where they are interminged with small remnants of the public domain and federally owned revested-grant lands remaining from the original Oregon and California Railroad alternate-section grant. In the Coastal Province, small tracts of private lands--from 40 to a few hundred acres in extent--are scattered within the boundaries of the Siuslaw National Forest, which occupies the bulk of the province (fig. 1). A large part of the Cascade Slopes Province lies within the boundaries of the Willamette National Forest and a small part lies within the Umpqua National Forest. Private lands in this province include small areas along a couple of the larger stream courses and a few dozen sections in a checker-board pattern. The State acreage is comprised of small parcels of a few hundred acres each in the Willamette Valley and Coastal Provinces.

Private Ownership

Private ownership includes 25 percent of the total sawtimber acreage, 68 percent of the acreage of seedling, sapling, and pole-timber stands, and 61 percent of the nonstocked area. The volume of live sawtimber on private lands is estimated to total 2,373 million board-feet (Scribner).

In the study of private landownership two broad classes of owner were recognized. Owners that operated a timber-processing plant in the county were grouped in an "industrial" class; all other owners were classed as "nonindustrial." The latter included loggers, farmers, business and professional people, wage earners, housewives, land-holding companies, and other miscellaneous owners.

Ownership Class	Commercial Forest Land	Sawtimber Volume
Private	37	22.0
State	1	.6
Federal:		
National forest	50	66.2
Bureau of Land Mgt.	12	11.2
Total	100	100.0

In general, the pattern of commercial forest-land ownership follows the natural division of the county into the three physiographic provinces. The private lands lie chiefly in the Willamette Valley Province, where they are intermingled with small remnants of the public domain and federally owned revested-grant lands remaining from the original Oregon and California Railroad alternate-section grant. In the Coastal Province, small tracts of private lands--from 40 to a few hundred acres in extent--are scattered within the boundaries of the Siuslaw National Forest, which occupies the bulk of the province (fig. 1). A large part of the Cascade Slopes Province lies within the boundaries of the Willamette National Forest and a small part lies within the Umpqua National Forest. Private lands in this province include small areas along a couple of the larger stream courses and a few dozen sections in a checker-board pattern. The State acreage is comprised of small parcels of a few hundred acres each in the Willamette Valley and Coastal Provinces.

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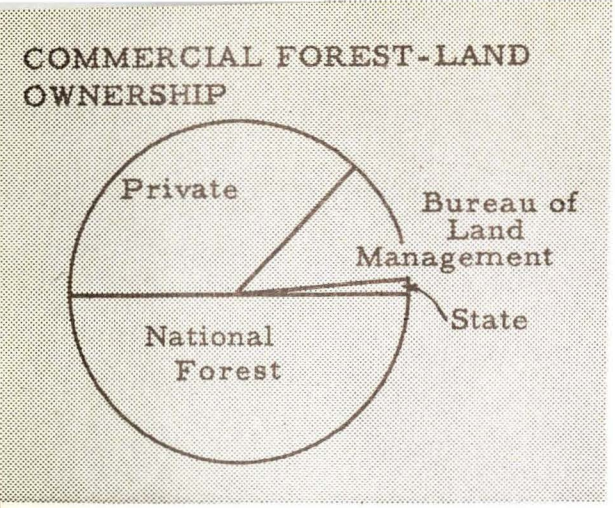


Three size classes of industrial owners were recognized: large, with 50,000 acres or more of commercial forest land in the county; medium, with 5,000 to 49,999 acres; and small, with less than 5,000 acres. Industrial owners hold a total of 586,000 acres, or nearly two-thirds of the 903,000 acres in private ownership (table 16); they own about one-fourth of the commercial forest land in all ownerships in the county.

Of the industrial owners, the large class has 36 percent of the total private commercial forest acreage but 44 percent of the private sawtimber area; the medium class holds 22 and 24 percent, respectively; and the small class owns 7 and 4 percent, respectively.

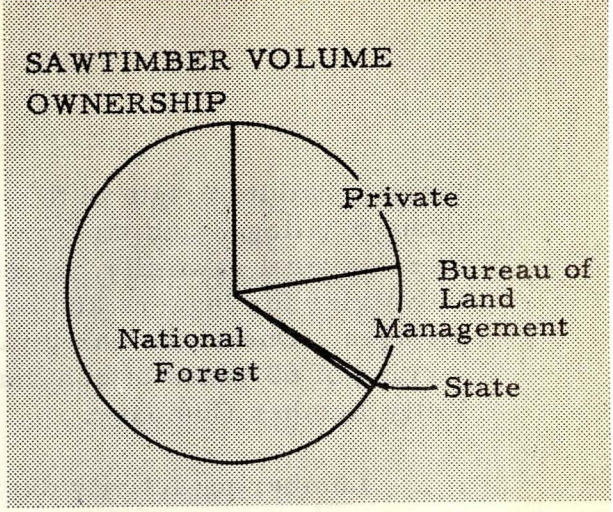
Bureau of Land Management Ownership

The Bureau of Land Management, U. S. Department of Interior, administers 285,000 acres of commercial forest land, of which a total of 277,000 acres is revested-grant land and 8,000 acres is public domain land. These lands comprise 11 percent of the total sawtimber acreage in the county, 14 percent of the young stands, and 9 percent of the nonstocked area.

Live sawtimber volume on the revested-grant lands totals 10,521 million board-feet (Scribner) and on the public domain lands, 326 million board-feet.

National Forest Ownership

The Forest Service, U. S. Department of Agriculture, administers three national forests in the county--Siuslaw, Willamette, and Umpqua (fig. 1).



Commercial forest land in the three national forests amounts to 1,209,000 acres. This acreage includes 63 percent of the county's sawtimber, 16 percent of the area of young timber, and 29 percent of the nonstocked area.

Live sawtimber volume on the national-forest lands is estimated to total 64,174 million board-feet (Scribner).

USES OF THE FOREST RESOURCE

Foregoing discussions regarding land classification indicated that the county has a tremendously valuable resource in its wealth of forest land. This resource has several major uses. Among them are timber production, watershed protection, wildlife habitat, recreation, and scientific study. All these uses are important but timber production is paramount, for the harvesting and processing of raw timber by the forest industries into various wood products is essentially the sum and substance of the county's economy.

FOREST INDUSTRY USE

History of Industry Development

Most records date the advent of white settlement in the area that is now Lane County as 1846; the county was organized in 1851. The fertile prairie lands of the central valley attracted the earlier settlers, and by 1860 nearly all of this land was held as donation land claims or homesteads. Settlement brought demands for building material and fuelwood, and the cutting of nearby timber stands served two purposes--obtaining wood products and clearing additional land for agriculture.

In 1851 the village of Eugene had a sawmill, which necessitated building a millrace for power. The millrace that now flows through

the city had its origin in this development. Springfield, another pioneer village, had its first sawmill two years later. By 1900 there were several sawmills, an excelsior plant, and numerous service industries for loggers and lumbermen in the vicinity of the two villages. One of the early sawmills, build in 1896, marked the beginning of 60 years of continuous operation in the county of Booth-Kelly Lumber Company.

Lumbering activity during the next two decades or so was carried on at an expanded rate. The year 1925 saw a harvest of 261 million board-feet of saw logs and a production of 286 million board-feet of lumber by 48 active sawmills.

Annual statistics of log production in the county are available, beginning with 1925. These show the trend of industry's consumption of raw material from local sources (fig. 2 and table 17).

Although reliable records of log import and export in the county are not available for the period, it is believed that prior to the mid-1930's practically all logs produced were consumed in local plants. During the latter half of the decade, a gradually increasing volume of peeler grade logs was exported to plywood plants in Olympia and Aberdeen in western Washington. Two plywood plants began

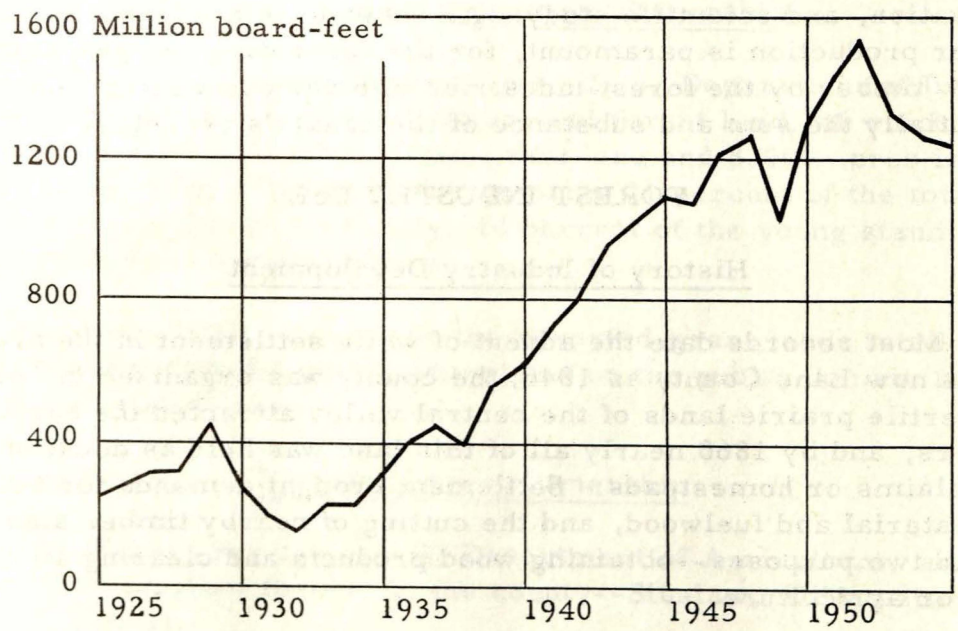


Figure 2.--Log production in Lane County, Oreg., 1925-55.

operating in the county in 1940 and these used a major part of the volume of peeler logs that had previously been exported. As the county's sawmill and plywood industries expanded, particularly since World War II, a sizeable volume of logs has been imported from neighboring counties.

Growth of the sawmill industry can be traced through a continuous annual record of number of active sawmills and lumber production during the 31-year period 1925-55 (fig. 3 and table 18).

The sawmill industry that developed in the county prior to World War II was characterized by a large number of small-capacity mills--under 40,000 board-feet per 8-hour shift--and a few medium-size mills of 40,000- to 160,000-foot capacity. This contrasted sharply with the usual pattern of mill capacity that had developed in earlier lumber centers of the Douglas-fir subregion. There were only a few mills with a capacity of 250,000 to 500,000 feet or more, a mill size class that was common in the Puget Sound, Grays Harbor, and Columbia River districts. The small-capacity mills in Lane County were no doubt due in part to the forest-land ownership pattern that prevailed at that time--many small individually owned tracts and a few large tracts in corporate ownership. Another important

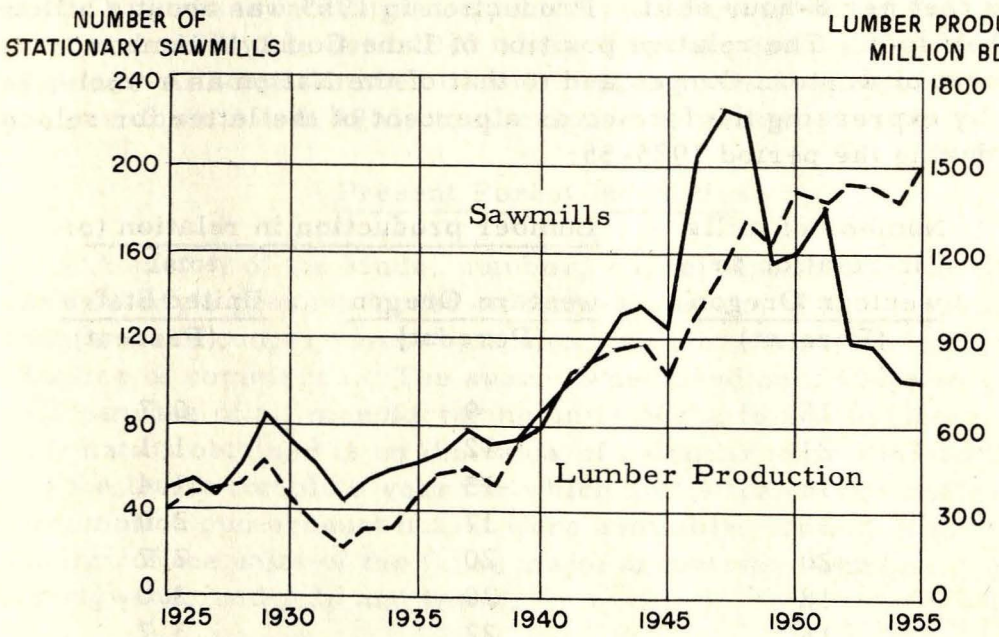


Figure 3.--Sawmills and lumber production in Lane County, Oreg., 1925-55.

factor influencing mill size was the lack of tidewater or rivers navigable to ocean-going ships. Practically all the large-capacity mills in the Douglas-fir subregion were located on tidewater; many were cargo mills producing large volumes of export timbers.

In 1940 the 78 active mills in the county had a combined 8-hour capacity of 3,160,000 board-feet. By 1945, the number of mills had increased to 124 and combined capacity, to 3,780,000 feet. There were 6 mills each in the larger capacity classes: 120,000 feet and larger, and 80,000 to 119,000 feet; together these two classes produced a little more than two-fifths of the three-quarters of a billion feet of lumber sawed that year.

In the decade following the war, 1946-55, the sawmill industry in the county expanded greatly. A large number of mills were built during the first three years of the period; there were 204 active mills in 1946, 225 in 1947, and 223 in 1948. Annual production of lumber climbed to more than a billion board-feet. Beginning with 1949, however, many of the smaller mills began to drop out, and by 1955 total number of stationary mills was down to 99. In addition, there were 42 portable mills of small production. Capacities in the surviving plants, particularly those of the larger classes, were expanded and by the end of the decade reached a total of more than 6 million feet per 8-hour shift. Production in 1955 was about a billion and a half feet. The relative position of Lane County's lumber industry to that of western Oregon and to that of the Nation as a whole, is shown by expressing the former as a percent of the latter for selected years during the period 1925-55:

Year	Number of mills in relation to western Oregon (Percent)	Lumber production in relation to: western Oregon (Percent)	Lumber production in relation to: total United States (Percent)
1925	15	9	0.7
1930	21	12	1.1
1935	16	15	1.4
1940	18	17	2.0
1945	20	20	2.7
1950	18	20	3.8
1955	18	22	3.7

Number of mills in the county has kept pace with the total number in western Oregon since 1925. Relative lumber production, however, more than doubled from 1925 to 1955, compared with western Oregon, and increased more than five times, compared with the Nation.

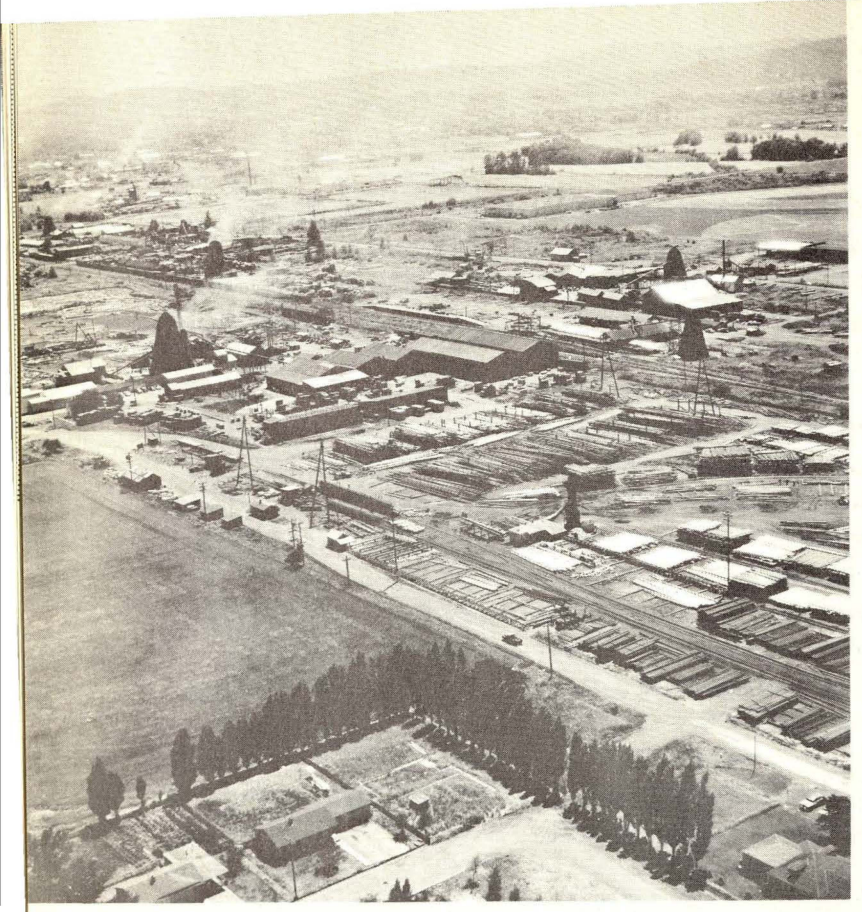
The plywood industry in the county dates from 1940 when two plants with a combined annual capacity of 152 million square feet of 3/8-inch, 3-ply plywood were built. There were no additional plants until 1946, when a green veneer plant began operating; three years later this plant was expanded to a complete plywood unit. Between 1949 and 1955 several plants were added to the industry. Some of these plants produce green veneer only, others--known as layup plants--purchase veneer for processing into plywood, and some are complete plants.

The county has one pulp and paper plant. This plant, using the sulfate process, began operating in 1950.

Although shingles and shakes have been made in the county for nearly as long as lumber, the industry has never been large scale. This is due chiefly to lack of readily accessible concentrations of western redcedar timber not damaged by worms. Records show a gradual increase in shingle output, with the exception of the depression years 1930-32, until 1940 when 15 mills produced 145 thousand squares. Although number of mills began to decline since that year and was down to 6 in 1955, total output was greater.

Present Forest Industries

A survey of the kinds, number, capacities, and production of Lane County's present forest industries was one of the supplemental studies made cooperatively by the experiment station and county chamber of commerce. The survey was based on a 100-percent field canvass of all manufacturing units of the forest industry. All information obtained is on the basis of calendar year 1955 as this was the latest complete year for which statistics on raw material consumption and product output were available. A map (fig. 4) shows location of the units of the three major industries--lumber, veneer and plywood, and pulp and paper.



Many forest industries are concentrated in the Eugene-Springfield area.

Lumber Industry

Lumber manufacture dominates among the county's present forest industries. A total of 141 sawmills--99 stationary mills and 42 portable mills--operated during 1955 (table 19). Collectively these mills produced 1,520 million board-feet of lumber. The stationary mills accounted for 98 percent of this volume.

As the combined rated capacity of the mills is somewhat more than 6 million feet per 8-hour shift, it is evident that the industry as a whole operated near full capacity, or even at a greater rate, during the year. Actually, many of the larger mills were on more than one shift and on year-long operation, whereas some of the smaller mills operated part time. The 11 mills in the large capacity class, 120,000 feet and more per 8 hours, had 34 percent of total capacity and produced 39 percent of the lumber volume. Mills in the next size class, 80,000 to 119,000 feet, had 18 percent of the capacity and manufactured a like percentage of the lumber. Smaller mills--up to 79,000 board-feet--had 35 and 13 percent of the capacity, respectively, but produced only 31 and 10 percent of the lumber.

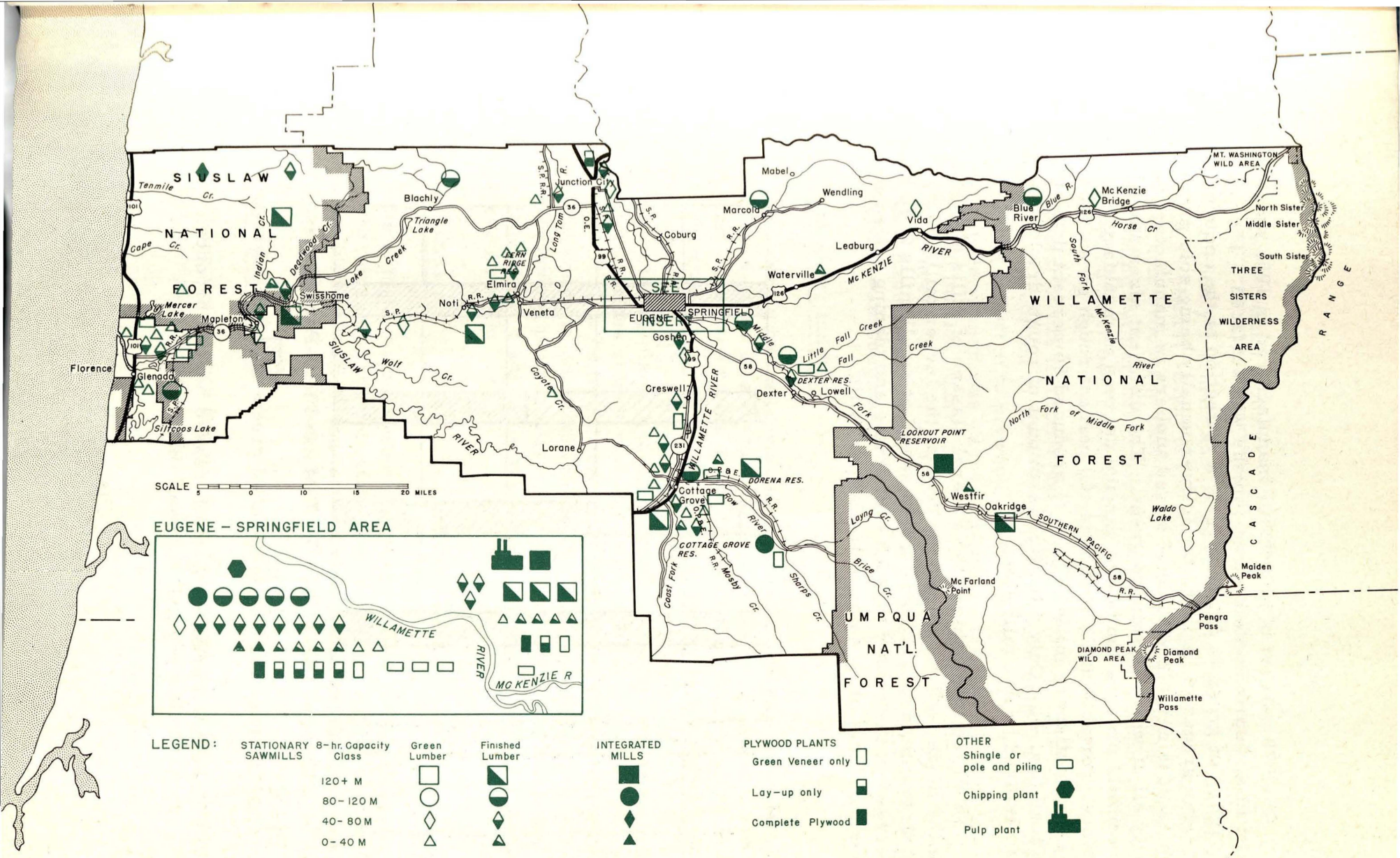


FIGURE 4 -- FOREST INDUSTRIES

LANE COUNTY, OREGON

1955

Over 70 percent of all lumber manufactured in 1955 was green, and of this, approximately three-fourths was surfaced. The high proportion of green to dry is largely a reflection of the common versus clear grades of lumber, the former usually being sold green. Also, a considerable volume of sawed timbers is manufactured, nearly all of which is shipped green. The different sizes and types of sawmills process lumber to varying degrees of manufacture. For instance, portable mills produced 100 percent rough green, whereas the large stationary mills (120 M +) produced 56 percent dried and surfaced (fig. 5). Only a negligible amount of rough-dry lumber was manufactured by any mill class.

Plant facilities among the several classes of mills also indicate the more refined processing done at the larger mills (table 20). Of course, much of the rough green sawed at small mills is further processed in the county through kiln drying and planing in remanufacturing plants or in some of the larger mills.

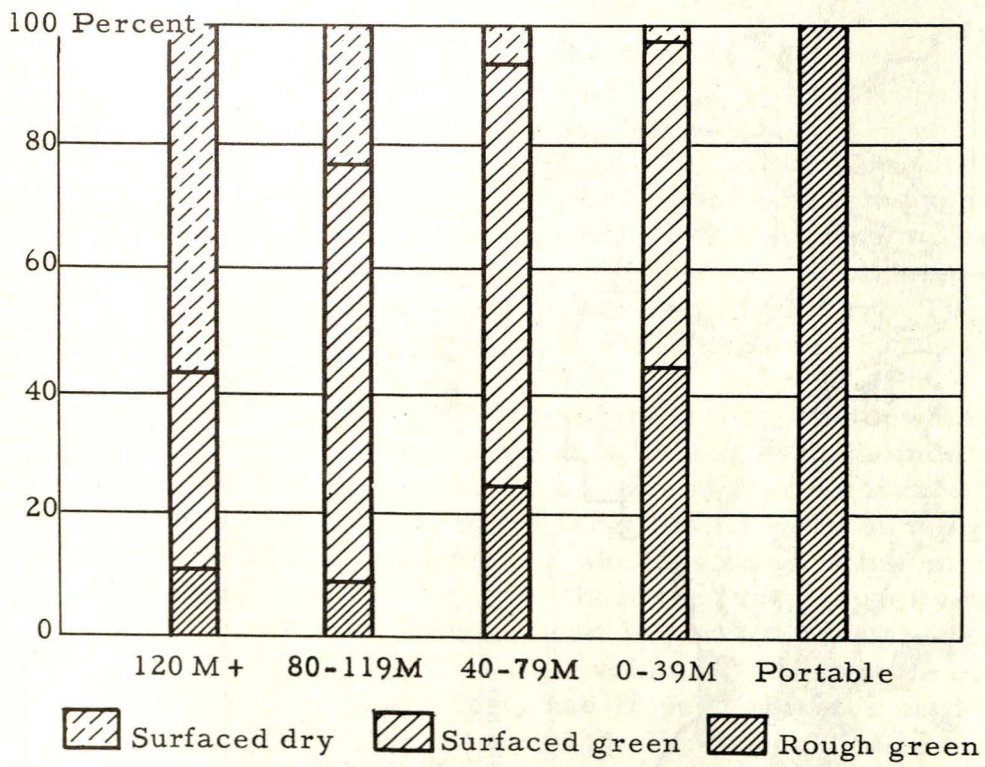


Figure 5.--Percentages of processed lumber produced by capacity class of mill, 1955.

Veneer and Plywood Industry

The county's veneer and plywood industry in 1955 was comprised of 19 plants. Eight of the plants produced green veneer only and sold their product in that form. There were 6 layup plants that did no peeling but purchased green veneer. Five complete plywood plants peeled their own green veneer.

A total of 626 million square feet (3/8-inch basis) of green veneer was produced in 1955. Some 99 million square feet of this volume was exported to plywood plants outside the county. As import of green veneer was 79 million square feet, there was a net export of 20 million square feet. This left 606 million square feet of green veneer. A total of 590 million square feet of 3/8-inch plywood was manufactured from this veneer. All of the green veneer and plywood was Douglas-fir.

Pulp and Paper Industry

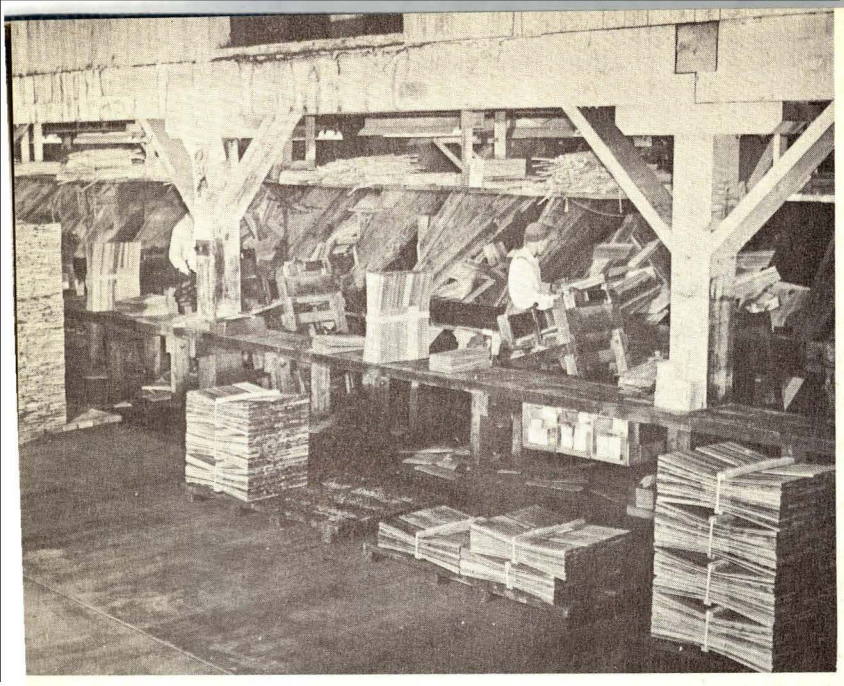
The county has only one pulp and paper plant but it is large capacity and ranks as a major segment of the local forest industry. This plant, operated by the Weyerhaeuser Timber Company, is a unit of the company's large integrated industry at Springfield; other units include a large sawmill, plywood plant, remanufacturing facilities, pres-to-log plant, and barking and chipping facilities. The pulp plant uses the sulfate process and has a rated 24-hour capacity of 375 tons. Raw material consists entirely of chips, most of the volume of which is converted from mill residues developed in sawmill and plywood plants. Also, some chips are made from defective logs. The paper plant has a rated capacity of 375 tons of Kraft liner board per 24 hours.

Shingle Industry

Six shingle mills operated in the county in 1955. Two of these mills were operated in connection with sawmills making western redcedar lumber. Reported total production during the year was 179 thousand squares of shingles.

Other Forest Industries

There are a large number of forest products plants in the county other than those producing lumber, veneer and plywood, pulp



Shingle mills increase utilization of western redcedar logs.

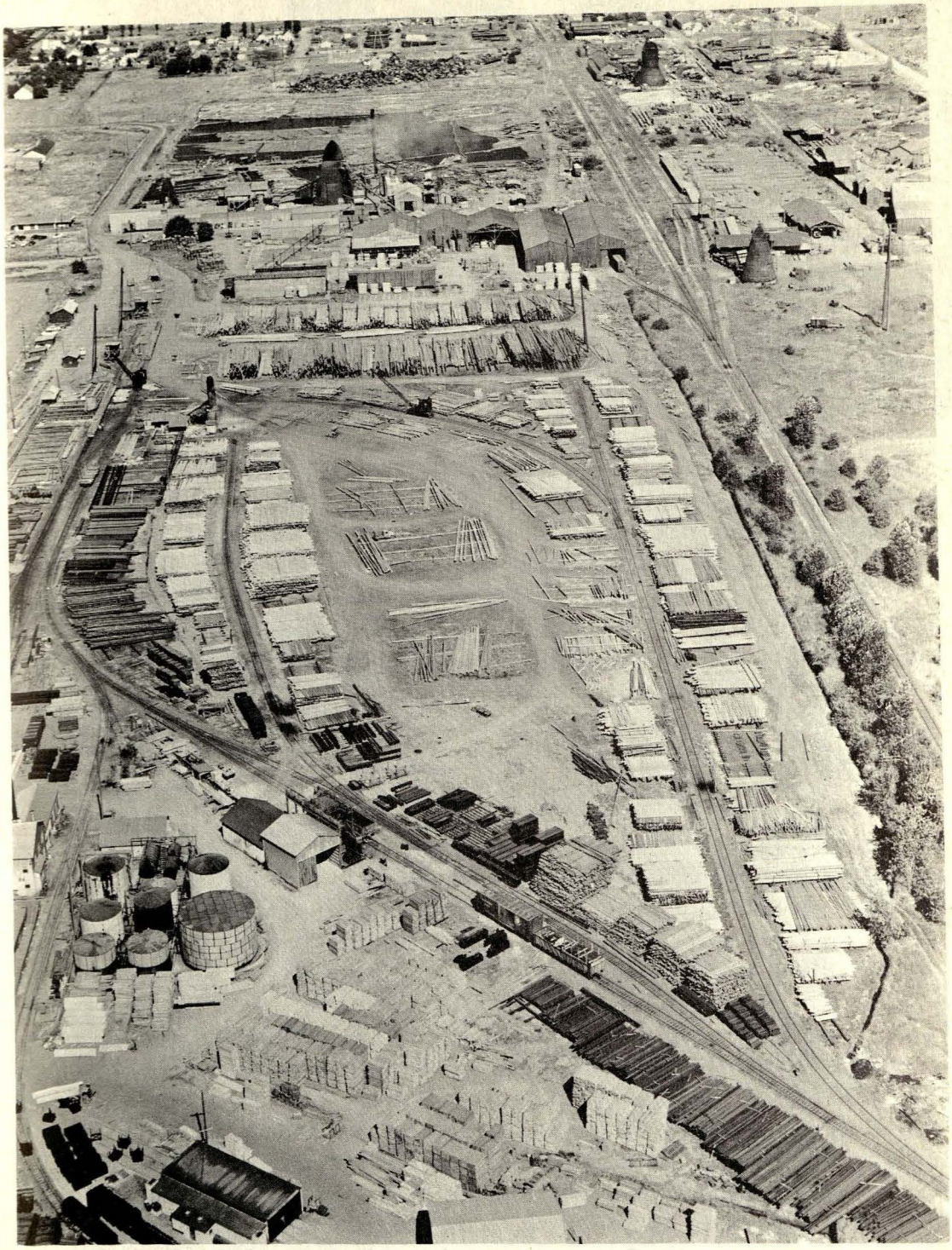
and paper, and shingles. Included among these are 8 planing and remanufacturing plants, 21 specialty or cut-up plants, 7 pole and piling yards, wood-treating yards, a wood-chipping plant, and several dealers in minor products such as Christmas trees, swordfern, and other greenery.

Recent Changes in Forest Industries

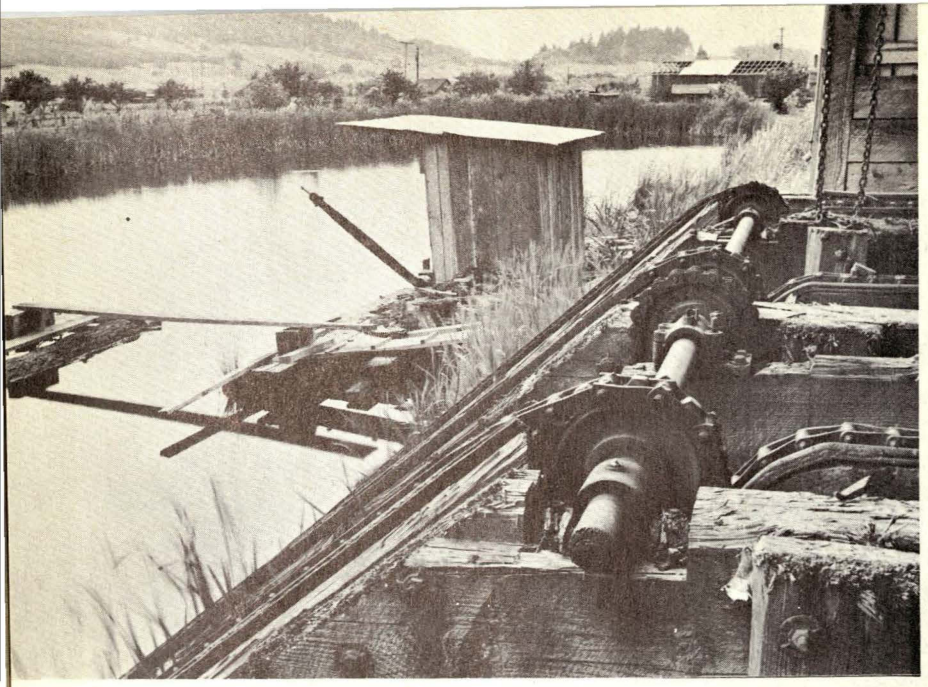
Information on the county's forest industries-their types, number, capacities, consumption of raw material, and production--were collected for this report in calendar year 1955. That year appears to have been a peak year in overall industry operation.

Changes in the structure of the lumber industry that have taken place since 1955 have been generally in the form of plant closures and some transfers of ownership. For example, 62 stationary sawmills with 8-hour capacity of 40,000 board-feet and larger were operating in 1955. In the early summer of 1957, 50 of these mills were in operation, 10 were closed down, one had burned, and one had been reduced in capacity to less than 40,000 board-feet. Information on changes in the small stationary and portable sawmill industry in the county since 1955 is not readily available, but it is apparent that an appreciable number of mills have ceased operations. The recent softening of the lumber market is undoubtedly responsible for much of the change in the sawmill industry.

The green veneer and plywood industry has been more stable than the lumber industry. Since 1955, new operations include one



Among the important smaller forest industries in the county are pole and piling yards, some of which have extensive facilities.



The recent softening of the lumber market has closed many of the smaller mills.

green veneer plant and one complete plywood plant; one complete plywood plant was lost through fire; and there was a transfer of ownership of a green veneer plant.

With regard to utilization of mill residues, several of the larger capacity sawmills have added barking and chipping equipment to facilitate the production of pulp chips.

Transportation Facilities

Transportation facilities for exporting manufactured products of the county's forest industries are generally adequate for most areas of industry concentration. However, there have been occasional railroad car shortages. Facilities for moving the raw material from the woods to the mill are lacking in some parts of the commercial forest zone (fig. 6).

Railroads provide well for the central part of the county, particularly for the Eugene-Springfield area, where industry concentration is heavy. Lines of the Southern Pacific radiate from Eugene. The main line runs north to Portland and southeasterly through Willamette Pass to Klamath Falls and California. The Siskiyou Route runs through Roseburg and Medford, and a branch line, the Willamette Pacific, heads west to the coast and then south to Coos Bay. In addition, the Oregon Electric, a branch of the Spokane, Portland, and Seattle Railway has a line from Eugene to Portland. Another rail line, the Oregon Pacific and Eastern, extends up Row

Railroads move lumber, plywood, pulp chips, and other forest products.

River from Cottage Grove to a sawmill at Culp Creek, and for a short distance up Mosby Creek to a log-reload station.

Highways connect most sections of the county with the remainder of the State. U. S. 99 extends north and south through the central portion, U. S. 101 parallels the coast, and State Route 36 connects the two between Florence and Junction City. State Route 28 leads eastward from Eugene up the McKenzie River and over the Cascade Range to Bend, whereas Route 58 follows up the Middle Fork of the Willamette River, crosses the Cascades, and connects with U. S. 97 some miles north of Klamath Falls. There are also numerous second-class county roads, many of them hard surfaced, and the remainder well graveled.

There is a fairly adequate network of logging roads through those parts of the county where timber harvest operations have been concentrated. This is especially true in the foothills and on the slopes surrounding the central valley. Several private roads for log transportation from woods to plant have been built and maintained by some of the larger forest industries.

Access roads are needed in much of the national-forest area in the county. In the Willamette National Forest there are large areas of inaccessible old-growth timber, particularly in upper watersheds of tributaries of the McKenzie River and the Middle Fork of the Willamette. In the Siuslaw National Forest, there is need for roads to tap timber in the upper watersheds of the North Fork of the Siuslaw River and Big, Upper Indian, and Ten Mile Creeks. This development could be a combination of operation-built and federally constructed roads.

Water transportation in the county is confined to segments of the Siuslaw and Willamette Rivers. The controlling depth over the bar at the mouth of the Siuslaw River at Florence is 12 feet, mean low water, and the channel depth in the river is also 12 feet to Mile 7 near Cushman. Because of inadequate jetties at the mouth of the river, the controlling depth, and the lack of port facilities, the Port of Siuslaw has been one of the least important ports on the Oregon Coast. According to the U. S. Engineers, the tonnage of forest products shipped coastwise over the bar in 1955 amounted to 12,733 short tons of lumber and shingles, and 1,191 short tons of posts, piling, and poles. Internal shipments on the Siuslaw river, but not over the bar, amounted to 225,485 short tons of rafted logs.

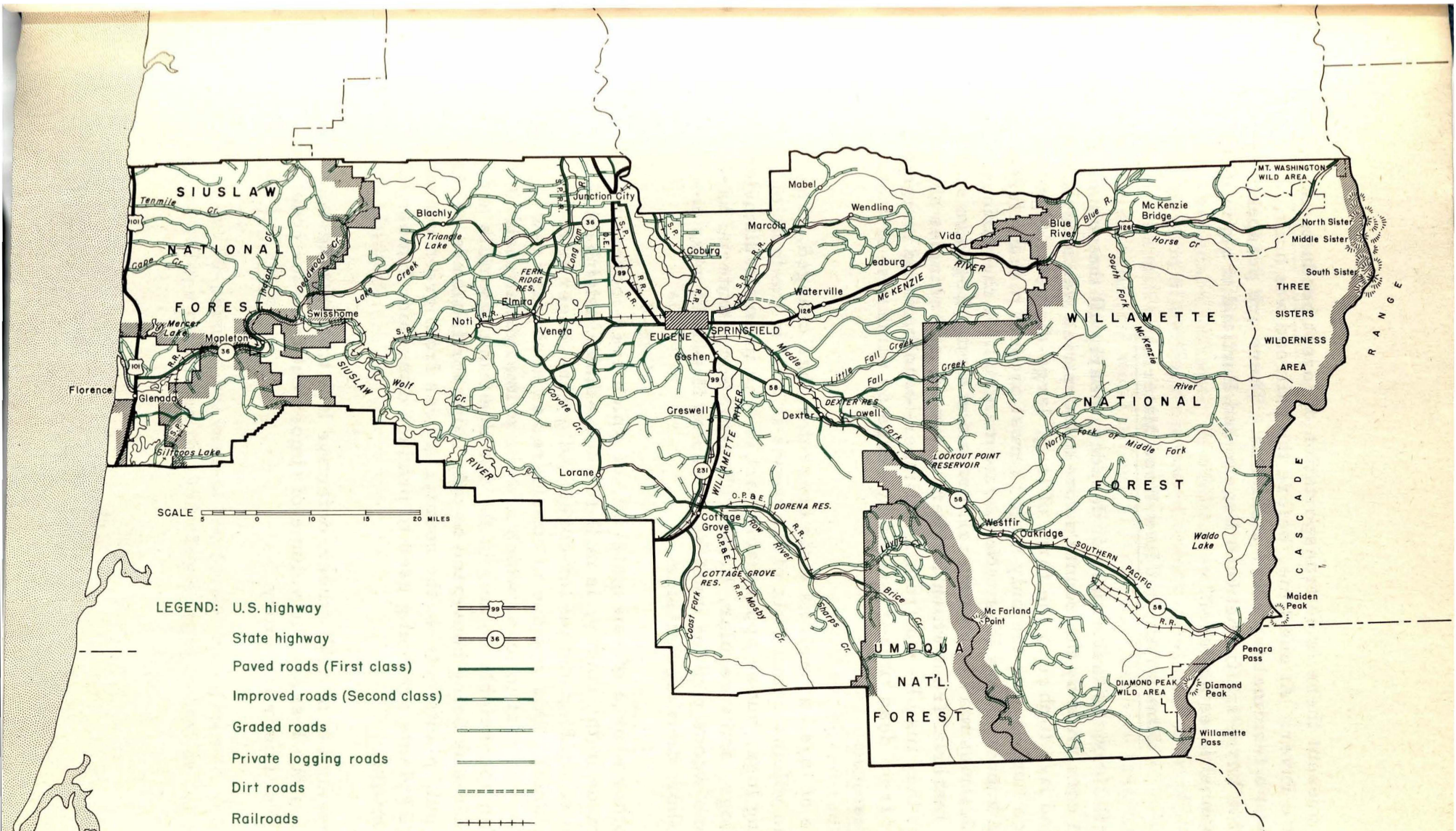


FIGURE 6--TRANSPORTATION SYSTEMS

LANE COUNTY, OREGON

1957

At present there is no transportation of forest products on the Willamette River. At one time, before the railroad was built, Eugene was a terminal for river steamers. There are prospects for appreciable barge traffic between Eugene and Portland if a minimum 4-foot channel is established.

Consumption of Raw Wood Material

Until about the last couple of decades, nearly all the volume of raw wood consumed by the county's forest industries was harvested from sound live timber in the form of long, large-diameter logs. And, since lumber was the only major forest product manufactured, logs were known as saw logs. Now, raw material for the various forest industries may be of several forms and kind. Logs are still the basic material from which lumber, plywood, and shingles are made, but they may be cut from live timber--wholly sound or largely defective; from dead timber--standing snags or windfalls; or from logging residue.

Size of logs, as well as their character, has changed. The bulk of the volume coming out of the woods is still in the form of large, long logs, but an appreciable part of it is in small-diameter or short logs, and irregular, broken chunks. Some material harvested from woods residue must be hauled on flat-bed trucks because of short or irregular size.

Another source of raw material, of which ever-increasing use is being made in the county, is mill residue--slabs, edgings and trim from sawmills, and peeler cores and green-veneer trim from plywood plants. This residue is considered as secondary raw material in contrast to logs, which are the primary material. At present, an appreciable volume of the residue from sawmills and plywood plants is being converted to pulp chips for local use or for export to pulp plants outside the county. Cores from green veneer and plywood plants are being used to produce dimension lumber in small sawmills.

Consumption of dead timber, defective live timber, and woods and mill residue lessens the volume of timber cut from the county's standing live timber inventory.

Consumption of Logs

In 1955 the county's sawmills, green veneer and plywood plants, and shingle mills consumed a reported total of 1,494 million board-feet, net scale, of logs. In addition to the sound volume, a considerable portion of the logs contained defective wood, some of the best of which was utilized. An appreciable, but undetermined, volume of marginal defective wood in logs classed as cull (less than one-third of the gross volume sound) was also utilized. The green veneer and plywood industry, in particular, used considerable volume of cull logs.

Of the near billion and a half board-feet of logs consumed, sawmills used 84 percent in lumber manufacture, 15 percent was peeled for plywood, and 1 percent went into shingles. The volume consumed for forest products was:

	Volume consumed (Million board-feet)
Lumber:	
Stationary mills	
120+ M per 8-hr. shift	519
80-119 M per 8-hr shift	212
40-79 M " " "	382
0-39 M " " "	111
	1,224
Portable mills	24
Total	1,248
Veneer and plywood:	
Green veneer plants	91
Complete plywood plants	140
Total	231
Shingles:	15
All industries	1,494

Source of Logs

A 100-percent canvass of the forest industries to determine source of logs consumed in 1955 showed that a total of 1,348 million

board-feet, or 90 percent of the total volume, came from Lane County's forests and 146 million, or 10 percent, came from forests of neighboring counties (table 21).

An additional study to determine source of logs by class of forest-land owner showed that 59 percent of the consumed volume of 1,348 million board-feet of logs from Lane County came from private lands and 41 percent from public lands--national-forest, Bureau of Land Management, and State lands. The percentages varied widely by size and type of industry:

Industry	Private land (Percent)	Public land (Percent)
Stationary sawmills:		
120+ M capacity class	59	41
80-119 M	47	53
40-79 M	61	39
0-39 M	84	16
Portable sawmills	100	0
Veneer and plywood plants	49	51
Shingle mills	77	23
All industries	59	41

The larger sawmills and veneer and plywood plants obtained a greater portion of their logs from public lands than did the smaller sawmills and shingle mills. The study also showed that sawmills in the largest class--120 M and larger--obtained nearly three-fifths of their log volume from industrially owned forest land, generally from their own. Table 22 gives detailed results of the study.

The consumed volume of 1,348 million board-feet of logs from Lane County is some 10 percent greater than the reported production of logs in the county during 1955, as compiled from various sources by the State Forester's office. No doubt there are a number of reasons for this difference. Among them would be such factors as differences in year-end log inventories, differences in scaling standards, and reporting discrepancies in both methods of arriving at the total volume. The reported volume of 1,221 million board-feet was accepted

as the year's production of logs. Production of logs on privately owned commercial forest land was 698 million board-feet, 57 percent of the total volume; production on public lands totaled 523 million feet, or 43 percent of production. Ownership source of logs produced in 1955 was:

	Volume--million board-feet, log scale (Scribner)
Private:	
Industrial:	
Small, less than 5 M acres	85
Medium, 5 to 49 M acres	120
Large, 50 M acres and larger	191
All industrial	396
Other	302
All private	698
State	1
Federal:	
National forest	415
Bureau of Land Management	107
All Federal	522
All ownerships	1,221

Not all of the 1,221 million board-feet of logs produced during the year was a withdrawal on the live-sawtimber inventory. A total of 974 million board-feet, or 80 percent of the volume, came from live timber; 247 million, or 20 percent, came from dead timber. This ratio varied by ownership class. On national-forest lands, 85 percent of the volume came from live timber and 15 percent, from dead; on other lands, including those in private, State, and Bureau of Land Management ownerships, the cut was 77 percent from live timber and 23 percent from dead.

In addition to the volume of live timber removed from the woods as logs, there is some sound volume that was not removed that would be included in a live sawtimber inventory. This volume is known as logging residue. Logging residue volume in 1955 is estimated to have been 95 million board-feet. Thus the total withdrawal from the live sawtimber inventory for the year was 1,069

million board-feet (Scribner); the average annual withdrawal during the five years 1952-56 is calculated to have been 1,126 million board-feet (table 23).

Export of Logs

In contrast to the reported 146 million board-feet of logs imported into the county in 1955, only about 15 million board-feet was exported during the year. Nearly all of this volume was peeler logs, some of which were shipped as far as Vancouver, Wash., approximately 125 miles. A small volume of pulp logs was exported.

Consumption of Plant Residue

During 1955, a total of 299,000 tons, bone-dry weight, of coarse mill residue was used as raw material by the county's forest industries in the manufacture of forest products. This tonnage, equivalent to approximately 127 million board-feet of logs, was used in the manufacture of pulp, lumber, and small wooden parts. This volume represents a worthwhile reduction in amount of timber cut from the live-timber inventory.

Export of Plant Residue

A total of 168,000 tons of pulp chips, made from plant residue developed in the county's sawmills and green veneer and plywood plants, was exported. This tonnage is the equivalent of 72 million board-feet of logs.

Forest Industry Employment

In 1955 the forest-product industries of Lane County employed an average of some 13,000 persons, with an annual payroll of over $60 million (table 24). Although these date represent only industries covered by unemployment compensation,[1/] virtually all forest-product industries in the county are included.

1/ Provisions of the Oregon Unemployment Compensation Law require coverage of employees in establishments hiring two or more individuals in any one day in each of six separate weeks during any quarter in a calendar year when the total annual payroll amounts to $1,800 or more.

The lumber-producing segment of the forest industry was by far the largest employer, with 55 percent of all workers and 54 percent of the total payroll. The veneer and plywood industry was second largest, with 22 percent of all workers and 23 percent of the total payroll. Logging contractors were next with about 15 percent of each. Data on company-employed loggers are reported under the manufacturing category of their company. A group within the industry, comprising a pulp and paper plant, chipping plant, remanufacturing plants, planing mills, and specialty plants, provided about 8 percent each of total employment and payrolls. Shingle mills and pole and piling plants combined had slightly over 1 percent of both employment and payrolls.

The magnitude and importance of forest industries to the county's economy is shown by the fact that they provide 85 percent of covered employment and payroll of all manufacturing industries and 52 percent of the total covered payroll and employment in the county. In 1955, Lane County continued to lead Oregon counties with 16 percent of the State total employment and payroll in the lumber and wood-products industries covered by the unemployment compensation law.

An estimate of the average annual wage earned per employee in each forest-industry group depends primarily upon proportion of skilled workers, hourly wage, overtime worked, and seasonal limitations. Employment and payroll data in table 24 provide a basis for broad comparisons between the several forest industries (fig. 7).

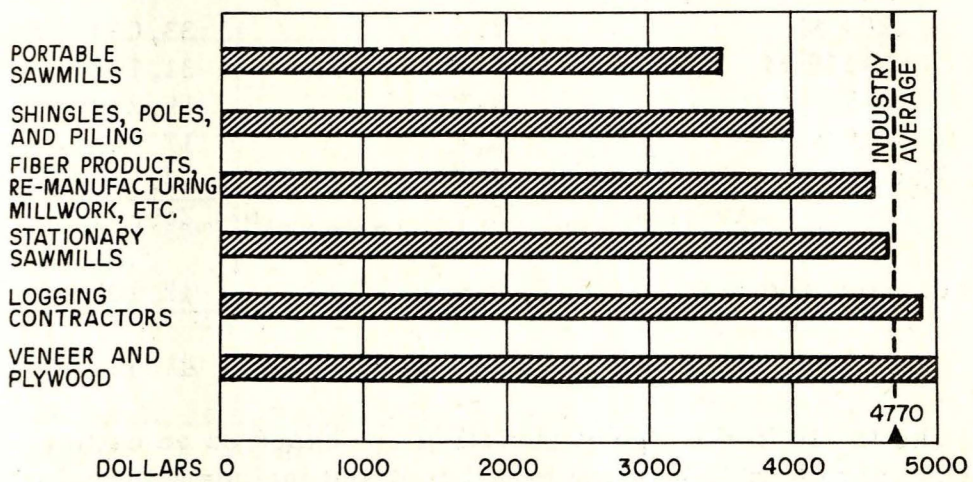


Figure 7. --Average annual wage by major forest industry groups, 1955.

The logging contractors and veneer and plywood groups were both above the average for all forest industries. This is mostly due to a high average hourly wage in the former and the continuity of employment throughout the year in the latter. Portable sawmill employment showed the lowest average annual wage because of the combination of seasonal work and a lower average hourly wage. The small stationary sawmills and the shingles and poles and piling group were also considerably below industry average. Although the 80-119 M board-foot daily capacity sawmill class appears to have the highest average annual wage, the nature of the data does not warrant a precise comparison by mill classes. The average of about $4,700 for all stationary sawmills would be more indicative; this figure approximates the total industry average.

Relation of Employment and Payrolls to Log Consumption

The forest industries had a payroll of some $40,000 for each million board-feet of logs consumed in 1955. The contribution made by sawmills and by veneer and plywood plants is shown in the following tabulation:

	Employees per million bd.-ft. of logs consumed (Number)	Annual payroll per million bd.-ft. of logs consumed (Dollars)
Sawmills:		
Stationary:		
120+ M	7.0	33,033
80-119 M	6.3	31,717
40-79 M	4.2	19,220
0-39 M	4.4	17,685
Portable	3.7	13,000
Average	5.7	26,831
Veneer and plywood	9.6	48,102
Total	8.7	41,331

The totals in the above tabulation are based on an estimated log consumption of 1.5 billion board-feet and include all employment and payrolls. Veneer and plywood includes a board-foot equivalent of green veneer purchased outside the county, but does not include

an undetermined volume of cull logs utilized. Inclusion of the latter, if it were known, would reduce the figures for this industry only slightly. A reasonable estimate of log consumption by the shingle industry and the pole and piling industry could not be obtained to provide data separately on these industries. The relatively small volumes that they consume would have little effect on the total industry average.

A declining market for wood products can have a very serious effect on the economy of the county. Thus, a 1-percent drop might mean a decrease of 15 million board-feet in log consumption, with a corresponding reduction in payrolls of some $620,000 annually. Although unemployment benefits may take up some of the slack, it is evident that purchasing power would be considerably less. Of course any justifiable increase in production would have a very beneficial effect.

Trends in Employment and Payrolls

From 1946 to 1955 the plywood industry increased employment 143 percent and payrolls 343 percent, compared with a slight decrease and 66 percent increase, respectively, in logging, and a 70 percent and 199 percent increase, respectively, in sawmilling (figs. 8 and 9).

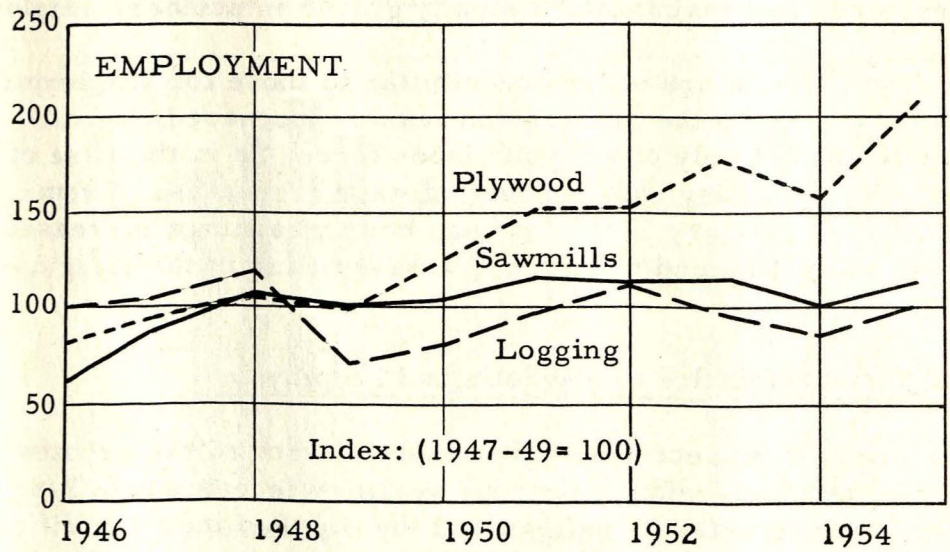


Figure 8.--Index of employment in Lane County, Oreg., by selected forest industries, 1946-55.

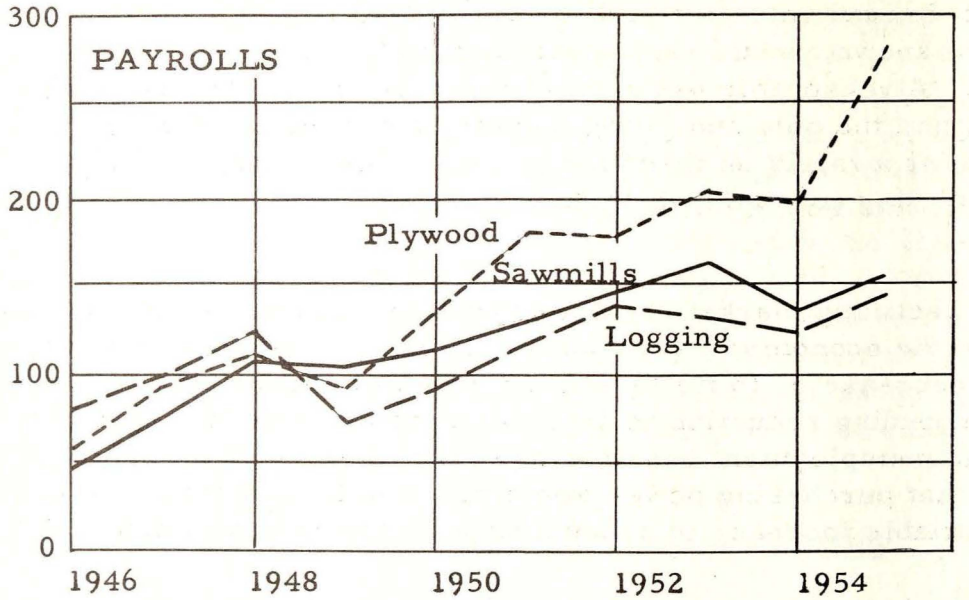


Figure 9.--Index of payrolls in Lane County, Oreg., by selected forest industries, 1946-55.

Most of the employment increase in sawmilling came immediately following World War II; since then there has been little change. Logging employment has shown more violent ups and downs, but the general trend has been level since 1946. The plywood industry, on the other hand, has maintained a steady growth in numbers employed.

Payroll trends are somewhat similar to those for employment, with plywood showing the greatest increase. Increased payrolls were the result not only of a larger labor force, as in the case of plywood and sawmilling, but because of wage increases. From January 1947 to January 1956, average hourly earnings increased 58 percent in logging and 53 percent in sawmilling in the Douglas-fir subregion.

Seasonal Characteristics of Payrolls and Employment

As might be expected, logging payrolls showed the greatest variation by quarters within calendar years, whereas sawmilling had a similar but less extreme pattern and the plywood industry differed from each of the foregoing (fig. 10). Based on an average for the 10-year period 1946-55, 60 percent of the logging payroll came between April and September, with the greatest percentage occurring

in the third quarter. Sawmilling payrolls followed the logging pattern, but reached just over 50 percent in the April to September period. Although plywood also reached about 50 percent of its payroll during this period, there was a drop in the third quarter that was quite contrary to logging and sawmilling payroll experience.

Seasonal employment trends were quite similar to those of payrolls. The following tabulation gives the monthly employment as a percentage of the annual average in logging, sawmilling, and plywood during the 1946-55 period:

	Logging (Percent)	Sawmilling (Percent)	Plywood (Percent)
January	74	89	94
February	82	92	96
March	93	97	99
April	103	101	100
May	109	103	98
June	113	106	98
July	114	103	94
August	118	105	97
September	112	106	103
October	100	102	108
November	96	99	107
December	88	96	104

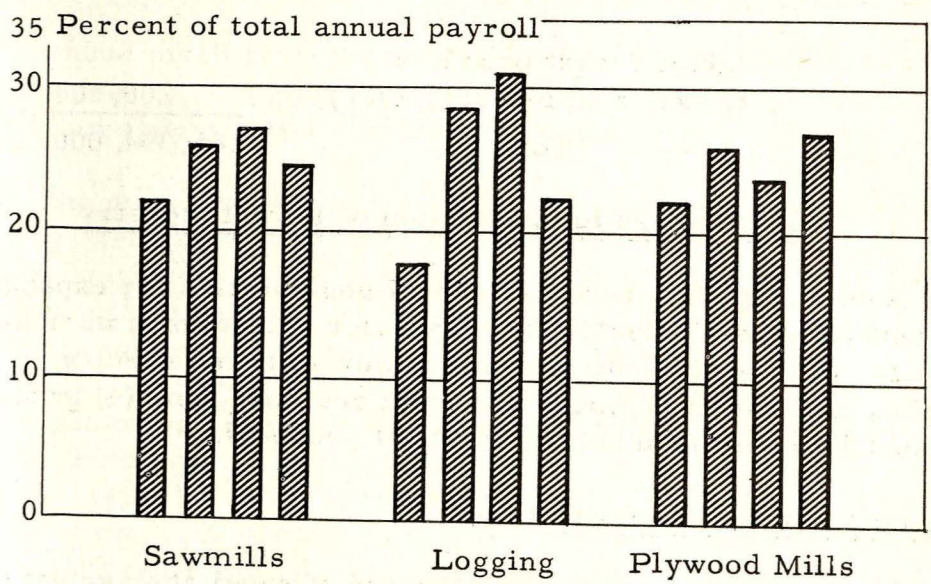


Figure 10. --Relation of quarterly payrolls to annual payrolls for selected industries in Lane County, Oreg. (1946-55 average)

Probably the long-term upward trend in plywood employment from 1946 to 1955 has had a greater effect than has season on the monthly pattern displayed.

Value of Manufactured Products

It is estimated that in 1955 the products manufactured by the forest industries had a value of approximately $185 million. Sixty-three percent of this value was due to lumber production, and veneer and plywood supplied 25 percent. Values by product are as follows:

	Value
Lumber - green	$ 76,020,000
Lumber - dry	41,040,000
Green veneer	1,470,000
Plywood	44,250,000
Shingles	1,253,000
Fiber products, remanufacturing, and millwork	20,138,000
Poles and piling	983,000
Minor forest products (Fern, huckleberry, etc.)	200,000
Total	$ 185,354,000

Opportunities for Expansion of Forest Industry

Analysis of data reveals several possibilities for expansion of the county's forest industry: (1) A greater volume of timber harvested annually, (2) use of hardwoods and minor softwood species, (3) more complete utilization of woods and plant residues, and (4) greater refinement in local manufacture of forest products.

Increased Annual Timber Cut

The large increase in the estimate of sawtimber volume in the county, as shown by a comparison of the 1956 inventory volumes with those of the two previous inventories, would seem to warrant a

greater cut of timber. However, several factors should be considered. An important factor is the relation of present sawtimber volume, 97 billion board-feet, to annual timber cut, 1.1 billion board-feet (1955), and to annual rate of forest growth, 0.46 billion board-feet. The cut is more than twice the growth, but in view of the large backlog of old-growth timber, this ratio does not appear incompatible with a management program that plans for the orderly harvest of mature timber and prompt restocking of the land with thrifty, growing, young stands.

In the matter of ownership, there is wide disparity in present inventory volume, annual cut, and annual growth between two broad ownership classes. Private owners hold 22 percent of the total sawtimber volume, they furnish 57 percent of the annual cut, and their stands are putting on 18 percent of the growth. In contrast, stands federally owned--on national-forest, revested land grant, and public domain lands--contain 77 percent of the sawtimber volume, they furnish 43 percent of the cut, and put on 82 percent of the growth.

It seems highly probable that the volume of timber cut annually will be increased substantially in the near future as revised allowable annual cuts are calculated for Federal timber, on the basis of new inventory figures, and the access road program expands. Some of the increase in cut from Federal lands may be partly offset by a gradual decrease in cut from private lands.

Because much of an increased Federal cut would be from large-size, old-growth, Douglas-fir in the eastern part of the county, there should be an opportunity for expansion in the veneer-plywood industry.

In the more distant future, when the old-growth timber has been harvested and all commercial forest land is stocked with growing young stands from 1 to rotation age--70 to 150 years, depending on the productive capacity of the land and the timber product desired--it is estimated that an annual cut of approximately 1.5 billion board-feet could be sustained. This estimate also assumes that the management program for the young stands would include intermediate cuttings, or thinnings, to harvest trees dying from suppression, root rot (Poria weirii) and insect attacks. Thus the mortality volume would be harvested, growth rate of the reserve trees increased, and timber quality of the final crop trees improved. When this goal is reached, all of the cut will be from young timber, and industry and product will have been adjusted to utilization of that type of raw material.

Use of Minor Species

To date, the timber cut has been chiefly Douglas-fir as this species has dominated the more accessible stands. Western redcedar and western hemlock, found as minor associates in the Douglas-fir type, have been harvested along with the fir, but in relatively small volumes. Because of this dominance of Douglas-fir on logged areas, the cut has not been in proportion to sawtimber volume. In recent years Douglas-fir has contributed 93 percent of the volume cut, whereas it comprises 80 percent of the sawtimber volume. Western hemlock comprises 8 percent of the volume but contributes 5 percent of the cut. For western redcedar, the percentages are 2 and 1, respectively. The other species form 10 percent of the volume but contribute only 1 percent of the cut.

As cutting progresses higher on the slopes in the eastern part of the county, the minor softwoods will become available. In that area, two hemlock species (western and mountain), four true firs (Pacific silver, noble, white, and subalpine), and Engelmann spruce have a combined sawtimber volume of nearly 14 billion board-feet. This volume represents a substantial supply of material particularly well-suited for the manufacture of high-grade pulp. Also, some of these species will no doubt be used in increasing volumes for lumber.

In point of sawtimber volume and utilization, hardwood species occupy an insignificant position in the county and have attracted relatively little interest in the past from forest industry. However, considered alone, the estimated sawtimber volume of nearly 1.7 billion board-feet of hardwoods represents a sizeable source of material. Approximately two-thirds of the hardwood volume is red alder and the bulk of the remainder is bigleaf maple. There are small volumes each of black cottonwood, Oregon white oak, golden chinkapin, and Pacific madrone.

Small quantities of both alder and maple have been used in the manufacture of furniture stock, and in recent years there has been increased interest in such utilization. However, the sawtimber supply of both species should warrant further expansion in this direction. Other possibilities are to saw for paneling lumber and to slice for furniture and panel veneers.

The recent development of a semi-chemical pulping process that can utilize hardwood material has focused attention throughout

the Pacific Northwest on alder. Currently, several pulp plants in the region are using alder in substantial quantities as well as maple and cottonwood.

The concentration of much of the county's alder volume in the coastal area makes this area a distinct source of pulpwood. Another factor to consider in this connection is the large supply of this species in nearby coastal counties--Lincoln and Tillamook to the north and Coos to the south. In western Washington, alder pulpwood is now being transported up to 100 miles.

Greater Use of Residues

Considerable progress has been made in the utilization of plant residue in recent years, but there is much material still unused. In 1955, the unused wood residue developed annually by the sawmills and green veneer-plywood plants in the county was estimated to be 663,000 tons, dry weight. Of this material, 351,000 tons--or more than half--was classed as coarse residue that, if bark free, would have been suitable for conversion into pulp chips; the remainder consisted of sawdust, shavings, and veneer dry-end residue.

In addition to the unused residue, it was estimated that 362,000 tons of coarse material was used as fuel--some in plant boilers to generate power and some sold as industrial, institutional or domestic fuel. Conversion of much of this tonnage to pulp chips would have constituted a higher use.

Coarse residue made into pulp chips during 1955 was reported to have been 366,000 tons, some of which was shipped out of the county.

Unused coarse residue from the sawmills and veneer-plywood plants, coarse residue used for fuel, and coarse residue exported from the county total about 750,000 tons. This would be a substantial supply of raw material for fiber processing in pulp or composition board plants. To make such utilization feasible, there is need for central slab-barker and chipping plants near concentrations of the smaller sawmills to serve those not able to install such equipment.

The amount of unused shavings and those used for fuel was reported to have been 253,000 tons in 1955. This would be a substantial supply of material for a particle-board plant.

Sawmills and green-veneer plants in the county accumulated more than 500,000 tons of bark during the year. A large amount was used for fuel in the plant boilers but this could be available for a higher use, such as chemical processing into oil-drilling muds or glue extenders in making plastics and linoleum. Small volumes of bark have been used in other parts of western Oregon for production of tannin. Other potential products from bark include wax and cork. (A soil conditioner has also been made from bark in western Washington.)

At the present rate of logging, approximately 500 million board-feet of sound wood material becomes available annually on logged areas in the county. This material, contained in logging residues on recently clear-cut areas, and in live cull trees, snags, and down timber on older cutover areas that have only been partially relogged, is classed as potentially salvable material. It is estimated that about a sixth of the volume is of sufficient size and quality to be classed as suitable for peeler blocks; the other five-sixths is suitable for sawlogs. Other sound wood not meeting specifications for peelers or sawlogs, but suitable for pulp or fiber, is estimated to total 39 million cubic feet. If all the sound material is considered for pulp or fiber, the total volume is placed at 75 million cubic feet.

Also available on logged areas is defective wood in the earlier stages of infection by "white-speck" fungi. Estimated volume of this wood, which is suitable for either saw logs or fiber, is 6 million cubic feet.

Salvable material represents a readily available source of wood for industry, as logging roads are already in. The economical utilization of much of this material will depend very largely on the development of specialized logging equipment, new manufacturing techniques and processes, and active markets for the forest products for which it will be utilized.

Greater Refinement in Manufacture of Product

Currently, about a fifth of the 1.5 billion board-feet of lumber manufactured in the county is shipped out rough green. Although a considerable portion of this volume is in the form of timbers, which require no further manufacture, there should be a sufficient volume of dimension and board lumber in green form to warrant additional

remanufacturing plant capacity. Less than two-thirds of the sawmills of under 80,000 board-foot capacity (8-hour shift) have planing mill facilities, and only 6 out of 76 mills of this class have dry kilns.

Of the sawmills of 80,000 board-foot capacity and larger, 22 out of 23 have a planing mill but only 14 have dry kilns. As more than half of the total lumber production is shipped surface green, additional dry kiln capacity seems warranted. The volume of surface-dry lumber produced in the county is also large, representing more than a fourth of total volume. Further manufacture could include cut stock, furniture parts, moldings, and sash and door stock.

THE WATER RESOURCE

In their close relation to the vital water resource, the forests of the county have one of their most valuable uses. Forests need water for growth; in turn they help to conserve and stabilize the water supply for other needs. How the forests are managed will materially influence the extent to which the bounties of an abundant water resource are realized. Good forest management is closely correlated with good water resource management.

Precipitation is plentiful over most of the county. In the Coastal Province it averages from 60 to 120 inches annually, with three-fourths of the rainfall coming in the 6-month period October through March. Runoff, chiefly through the Siuslaw River system, seldom reaches flood stage. However, because of light summer precipitation, stream flow in the river fluctuates widely. The Willamette Valley Province receives an average of 35 to 40 inches of rainfall annually, chiefly during the late fall and winter months. Runoff from the valley floor through the Willamette River system is generally not in damaging flood volume except when merged with heavy flow from tributaries of the river draining the broad watersheds of the Cascade Slopes Province. In the Cascade Slopes Province, precipitation ranges from 40 to 120 inches, much of it in the form of snow.

In past years, prolonged periods of heavy rainfall accompanied by rapid snow melt have resulted in flooding of large areas in the central valley and much damage. One of the objectives of the Federal Government's Willamette Valley Project, involving construction of 11 multipurpose dams and storage reservoirs in the county, is to prevent seasonal floods. Five dams--Fern Ridge, Cottage Grove,

Dorena, Dexter, and Lookout Point--have been completed, Cougar and Hills Creek dams are under construction, and the others are authorized but funds have not been made available. In addition to flood control, the project will provide power, irrigation, recreation and wildlife-habitat benefits.

An abundant supply of water is essential to man's well-being; to a large degree, the amount available sets limits to urban, industrial, and agricultural development. In the headwaters of the Willamette River system, Lane County has a number of streams that contribute to the economic development of the county. The maximum and minimum flow in the Willamette River and its principal tributaries are shown in the following tabulation:

Stream	Maximum flow	Minimum flow
	(Cubic feet per second)	
Middle Fork Willamette		
At Jasper	122,000	610
Willamette River		
At Harrisburg	210,000	1,990
Coast Fork Willamette		
At Saginaw	32,900	7
McKenzie River		
Near Springfield	43,500	535

Detailed flow data is given in table 25.

The extent to which water is available for future development depends not only upon total stream flow but also upon existing demands made on the supply. Exact quantitative estimates of water use are not available, but relative water usage is indicated in a study by the State Water Resources Board of legal water rights held by individuals, industries, and governmental units. On principal streams, present water rights for consumptive water use--which largely removes water from future available use--amounts to 2,047 cubic feet per second. Most of this is obligated for irrigation projects, both planned and existing, with industrial and municipal requirements next in volume. Non-consumptive usage of water, which

largely returns the water to stream flow, amounts to 2,924 cubic feet per second. Present water rights are as follows:

Consumptive water (Cu. ft. per second)		Nonconsumptive water (Cu. ft. per second)	
Irrigation	1,646	Power	2,602
Industrial	207	Fish	149
Municipal	168	Recreation	1
Domestic	25	Ponds	153
Livestock	1	Mining	19
Total	2,047	Total	2,924

Detailed water-rights data, by stream, is shown in table 26.

Dams and reservoirs are important facilities for water resource management and provide recreational opportunities for many persons.

Water for Industry Use

Water supply, except for pulp mills, is not a critical factor in determining plant location for forest industries. Water requirements for sawmills, plywood and veneer plants, and most composition board plants are nominal and usually do not limit plant location or expansion.

The location or expansion of pulp plants is largely dependent upon an adequate supply of water. Large quantities of pure, fresh water are required to wash the pulp clean of chemicals, and an adequate volume of water in rivers throughout the year is necessary to provide a means of disposing of mill effluent.

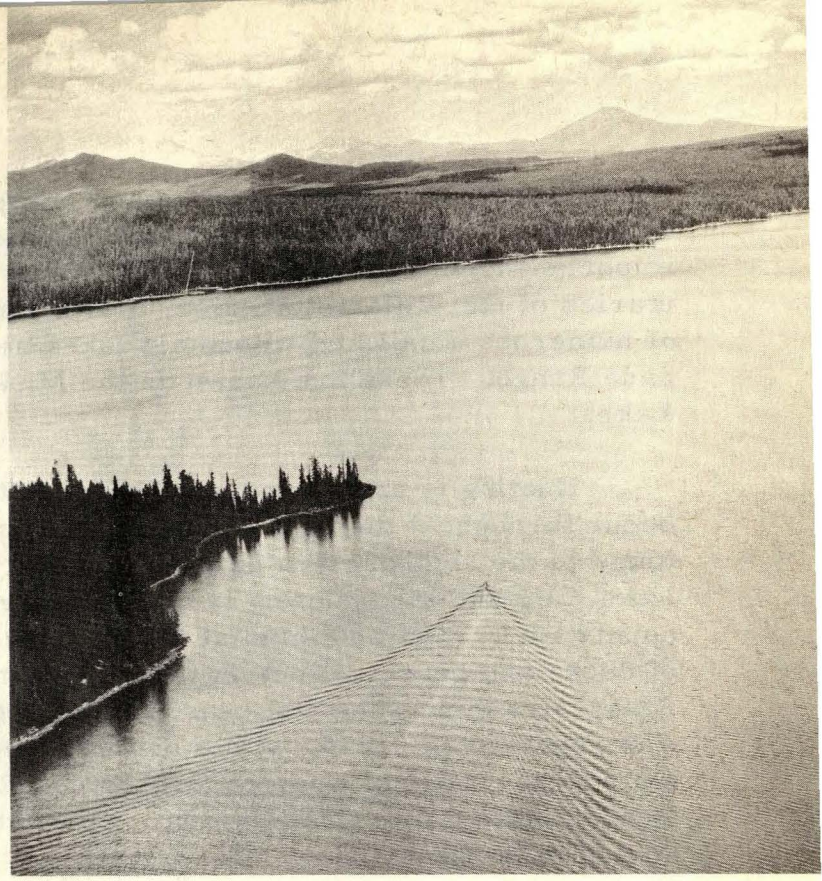
Water supply requirements are probably sufficient in several locations in the county. But according to a report by the Oregon Development Commission,[2/] most streams do not provide sufficient flow for discharge of effluents. It is not believed that the State Sanitary Authority would allow a conventional sulphate pulp mill to discharge untreated effluent to any of the streams above the confluence of the McKenzie with the Willamette River. With regard only to water supply, this would limit pulp mill location in the Willamette Valley Province to a location north of Eugene.

In the coastal area of Lane County, surface flow is not sufficient for a pulp plant without impoundment. There is a possibility of obtaining sufficient water by tapping sand dunes for a subsurface water supply. This depends upon the underlying geologic structure, and further investigations are needed to determine the feasibility of obtaining water from this source. (Studies are now being made in neighboring coastal counties.) Effluent from a pulp plant near the coast could be disposed of by piping it into the ocean, a few miles offshore.

RECREATION AND WILDLIFE HABITAT

In their broad reach across western Oregon--from ocean beaches to snowcapped mountains--the boundaries of Lane County encompass a land exceptionally well suited for outdoor recreation.

2/ Wood Residue Utilization Study, Oregon Development Commission, Portland, Oreg., May 31, 1957.



A great variety of such natural features as forests, lakes, and rugged mountains provide habitats for wildlife and exceptional recreational opportunities.

Here, among a great variety of natural features such as big and little streams, broad valleys, coastal and mountain lakes, sharp ridges, steep slopes, and deep canyons, forests have a most important role. Through their coverage of seven-eights of the county's surface, managed forests can assure a stable water supply for the rivers and lakes and favorable habitats for wildlife, both aquatic and terrestrial. Also, these forests are an integral part of the scenic beauty of the area.

A wide range of recreation activity is available. It varies from the active-participant type such as fishing, hunting, winter sports, swimming, hiking, boating and water skiing, and mountain climbing, to what may be called the inactive-relaxation type, which includes travel and sight-seeing, camping, picnicking, and residence in recreation homes, resorts, and organization camps.

Fishing is the most popular of the active forms of recreation. This is understandable in view of the large number of streams, lakes, and reservoirs and the variety of game fish present. Native and introduced species of trout; sea-run migrations of Chinook and silver salmon, steelhead and cutthroat trout; and such spiney-ray

species as bass, bluegill, perch and crappie are caught. The McKenzie River is an internationally known trout stream. Other important trout waters in the eastern part of the county include tributaries of the Willamette River, Waldo Lake, and two concentrations of numerous small high-mountain lakes near the summit of the Cascade Range. These are known as the Mink Lakes and Taylor Burn Lakes.

Hunting is another popular sport in the county. Blacktail deer occur throughout the forest zone in appreciable numbers and elk are found in the southeastern part of the county, in the vicinity of Waldo Lake. Upland bird hunting is chiefly for ringneck pheasant; the county ranks high as a habitat for this species. Sizeable migrations of ducks and geese collect on the Willamette River and some of the reservoirs during the fall season. Deer kill in the county in 1956 was reported as 9,845, with a hunter's success of 61 percent--highest success ratio of western Oregon counties--according to the Oregon State Game Commission. The number of elk killed was reported to be 89.

The popularity of fishing and hunting is seen in license sales during 1956 as reported by the State Game Commission. More than 55,000 licenses were sold in the county; 48 percent of the licenses were for angling, 35 percent for hunting, and 17 percent were for combination licenses. Total value of licenses sold was $295,000.

Camping and picnicking facilities are many and well distributed throughout the county, except in some of the inaccessible areas in the eastern part (fig. 11). These facilities have been developed and maintained by the county, State of Oregon, U. S. Forest Service, and a number of private timberland owners. They include:

	Number
Lane County parks	22
State parks and wayside areas	10
National forest campgrounds and recreation areas	64
Private tree-farm parks and picnic areas	8
Total	104

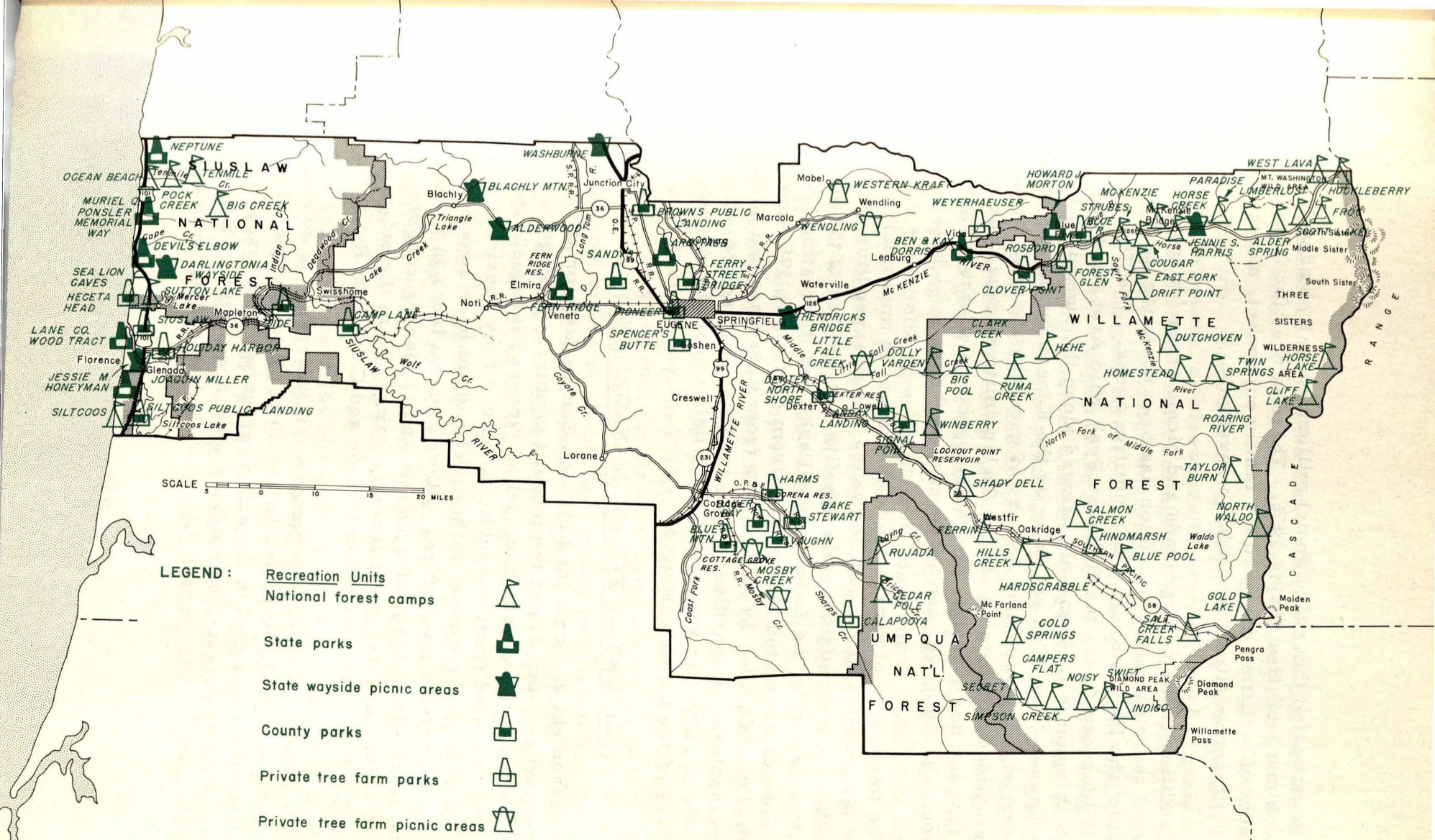


FIGURE II-- RECREATION FACILITIES
LANE COUNTY, OREGON
1957

It is estimated that more than 3 million users took advantage of the combined facilities during 1956. There is need for further development of facilities designed for family enjoyment, and there are many attractive sites that could be developed.

In addition to the campgrounds and picnic areas for motor-transported recreationists, provision has been made for the more hardy souls who like to rough it in primitive areas. The Three Sisters Wilderness Area, the Diamond Peak Wild Area, and the Mount Washington Wild Area--all situated along the summit of the Cascade Range--have been set aside by the Forest Service as examples of rugged, high-mountain country of exceptional scenic beauty to be maintained in a natural state. Such primitive areas, accessible only by foot and horse trails, are the playgrounds of hikers, horsemen, mountain climbers, and wilderness seekers.

The total value of recreation to the county is impossible to appraise accurately, for in addition to the direct expenditure of money, there are many intangible benefits. Some idea of the income is seen in a report by the Lane County Parks and Recreation Commission, which estimated that income from tourists in 1955 amounted to $20 million. Of this, $9 million was from fishermen and $5 million from hunters. Regardless of the total financial return, it is reasonable to state that recreation and wildlife habitat constitute major uses of the forest resource.

HISTORY OF FOREST MANAGEMENT

Management of forest land in Lane County dates pretty much from the first two decades of the present century. During the first decade, the national forests (then called "forest reserves") in the county were created from the public domain. They consisted chiefly of lands that up to the time of withdrawal had not been considered desirable for private investment. Other Federal lands in the county included remnants of the public domain and, following congressional action in 1916, revested grant lands remaining from the original grant of alternate sections to the Oregon and California Railroad.

The State of Oregon still owned a minor acreage of school grant lands--originally sections 16 and 36 in all townships. The major part of the acreage in the school grant had been disposed of earlier. Private forest-land holdings were acquired through donation land claims in the central valley, by homesteading, and through

the Preemption Act and the Timber and Stone Act. Several consolidations of sizeable acreages had been made by 1900.

The first really conscious effort toward management of forest land in the county, as elsewhere in western Oregon, came about 1910 in the form of protection against fire. This was true of land both in public and private ownership. Previously, the principal activities of national-forest administrators included boundary establishment, classification of lands as forest or agricultural, appraisal of water-power resources and sites, prevention of timber trespass, and handling of free-use permits. There was no field administration of public-domain lands and the Federal Government had only an indemnity interest in seeing that provisions of the Oregon and California railroad grant were carried out by the grantee. The State was still disposing of school-grant lands and some of the larger private owners were building sawmills and beginning to utilize the timber.

The year 1910 was a particularly bad forest-fire year in Oregon as well as in the other States of the Northwest. Timber loss in Oregon during that year has been estimated to have been as much as 2 billion board-feet (by 1910 utilization standards; the volume would be much greater by 1956 standards). The fire losses focused attention on the need for legislative action in providing forest protection laws and also on the desirability of public and private cooperation. Accordingly, in 1911 the legislature reorganized the State Board of Forestry from the Oregon Conservation Commission created in 1909. Organization of protection and fire suppression on forest lands in private, State, and county ownership was the primary work of the Board for a number of years. By the end of 1911, a number of forest protective associations had been formed by private timberland owners of contiguous and intermingled tracts.

Another legislative act, the Fire Patrol Law (1913), provided for compulsory patrol of timberlands by the owners. This protection was carried out by the private protective associations, with cost distributed on a pro-rata basis for the lands protected.

Federal cooperation in forest protection came first through the Weeks Law of 1911, which authorized financial cooperation with the States in the protection of headwaters of navigable streams. In 1924, much broader Federal cooperation was provided by the Clarke-McNary Act. This act authorizes cooperation with the States and, through them, with private owners in the protection of all private and State

forest lands from fire. It also provides authorization for up to half the cost of production of tree-planting stock in State-operated nurseries.

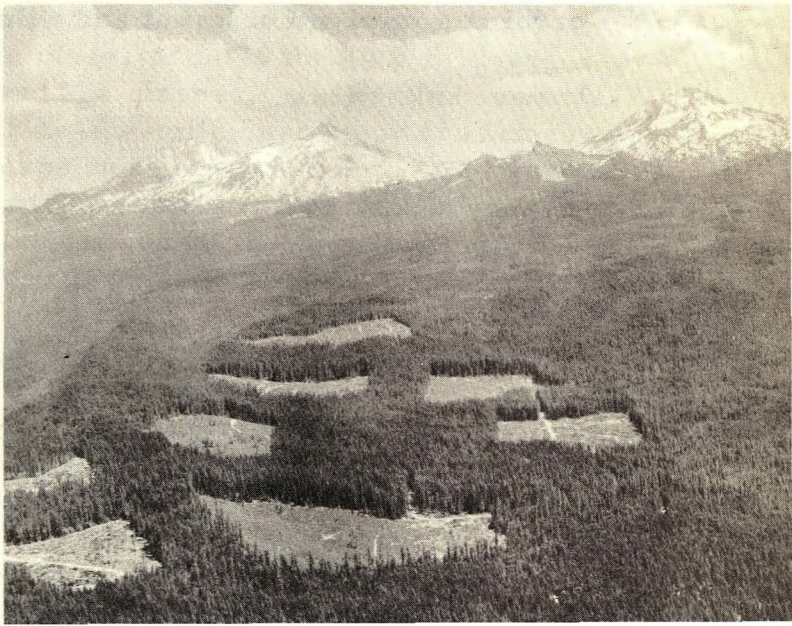
The year 1941 was particularly important in the management of Lane County's forests for two reasons. First, the State legislature passed the Oregon Forest Conservation Act, the purpose of which is to assure management of forest land for continuous crops of timber. This is to be accomplished through prompt restocking of cutover areas, either naturally--by leaving individual seed trees, seed-tree strips, or seed-blocks on logged areas--or by artificial reforestation. Second, the Douglas-fir industry began its Tree Farm program during the same year. A number of Lane County timberland owners were among the first certified tree farmers in the Nation, when their properties were certified in 1942. The tree farm program marked the beginning of industrial forest management on an intensive scale in the county. The program has expanded steadily and now there are 28 tree farms either entirely or partly in the county. Their combined acreage totals 450 thousand acres, nearly one-half the total acreage of privately owned commercial forest land.

Timber cutting practices in the county have changed materially since the early 1900's. Logging to date has been limited almost entirely to pure stands of Douglas-fir or to stands in which Douglas-fir was the predominant species. While the general practice has always been to clear cut this species, stands of old growth in parts of the county in which there was considerable defective timber were harvested by a form of partial cutting in earlier years. Any tree suspected of containing cull material was left standing. There is a fair-sized acreage of these partially cut areas on the lower slopes east of the central valley. Some of these areas are now considered a good relogging chance, and in recent years a large acreage has been relogged for salvable material in live cull trees, snags, down timber, and live young-growth timber that has reached merchantable size since initial logging.

Other than on areas of defective timber, and before the advent of wide-scale truck logging and the Oregon Forest Conservation Act of 1941, the common practice in the county was to clear cut in continuous operations, progressing broadly across a timber holding, and at times leaving scattered, low-quality trees. Generally, no special provisions were made for restocking the areas and--due to lack of seed and the recurrence of accidental fires--many clear-cut

areas reforested slowly and often inadequately. The practice of providing a nearby seed source, specified by the Conservation Act and made feasible by truck logging, has taken several forms. First, several individual seed trees per acre were left, but windthrow was common. Then seed blocks, each block comprised of a small, solid group of trees, came into vogue. Finally, the system of staggered settings evolved.

This system, involving the clear cutting of small areas in a patchwise pattern that opens up no more than about 25 percent of the timber tract at a time, is designed to assure prompt and adequate reseeding. No large continuous areas of slash develop, and each slash area is surrounded by green timber. At first, staggered settings ranged up to 100 acres in size; now, after a gradual reduction over the years, practice is to cut smaller areas--down to as low as 10 acres. The settings are laid out to minimize windthrow of trees around the perimeter of the cutting. This form of logging promotes rapid development of a road system through a timber tract for protection and for salvage of insect- or disease-killed timber, windthrown trees, or other mortalities on the perimeter of the setting or in uncut timber between settings. The system is now used on Federal lands managed by the Forest Service and the Bureau of Land Management and on private lands where there is a sufficient timber acreage to allow this type of cutting.



Current forest practice is to clear cut by a system of staggered settings, which opens up no more than about 25 percent of the timber tract at a time.

A further development in the general program for prompt restocking is artificial reforestation of a setting by planting or seeding the first season following logging if a bountiful seed crop from surrounding timber is not apparent.

Other constructive management measures have been initiated in the county on an increasing scale in recent years. Felling of snags to reduce fire hazard, in established stands of young timber as well as on current logged areas, is one of the important measures. The building of fire roads and development of water basins are also effective measures. Another is the reclamation through chemical treatment of brushy areas that often comprise the better sites of bottomland and lower slopes. Planting and seeding of nonstocked cutovers and burns is another practice that has put a sizeable acreage back into timber production. Construction of roads by private owners and the Federal agencies to salvage timber windthrown or killed by the Douglas-fir bark beetle in 1950-52 opened up much inaccessible timber and also made both owners and loggers more timber-salvage conscious.

In addition to a more vigorous program of fire protection by timberland owners and a greatly improved attitude toward fire prevention by the general public, there has been more interest in other forms of forest protection work. The control of forest insects, tree diseases, and damage by deer, bears, and pack rats and other rodents is now receiving much attention. A great deal of research in the relations between wild animals and forests is needed in solving the problems involved in forest and wildlife management.

APPENDIX

FOREST SURVEY PROCEDURE

Procedures used in the second Forest Survey reinventory of the forests of Lane County were materially different from those used in the initial inventory and first reinventory. This change in procedures accounts for some significant differences in both forest-area and timber-volume statistics obtained. Therefore, a brief description of procedures used in each inventory is in order.

Initial Inventory

The initial inventory of the county's forests was conducted in 1932 by what is known as the "compilation method." In this method, existing information on forest types, timber cruises, and other pertinent data was collected from private timber owners and various public agencies. These data were checked in the field for reliability and, in case of timber cruises, were adjusted to the specifications and standards of Forest Survey. Forest-type and timber-volume data for areas not covered by existing information were obtained through intensive field reconnaissance. Timber-volume estimates for immature stands were determined from normal yield tables adjusted for site, age, and density of stand.

All land in the county was classified as either forest or nonforest. Forest land was further classified as commercial or noncommercial. And, the commercial forest land was still further classified by type, stand-size class, and--in the case of young-growth stands--by stocking and age classes. These types and classes were delineated on 1-inch-to-the-mile base maps of each township. These township type maps were then superimposed over ownership-status plats and dot-counted to obtain forest-type-area statistics by ownership class. Type delineations on the township maps were traced on a base map of the county to form a county forest type map.

First Reinventory

The first reinventory, in 1942, included a complete revision of the forest type map of the county. For this revision, records of cutting and other forms of depletion since the original inventory were obtained from various sources and verified in the field by ground reconnaissance. Areas on which the type had changed due to cutting,

restocking of cutover or burned-over land, or ingrowth of immature stands were remapped on the ground. The ownership status was brought up to date. On the basis of the new ownership data and the revised forest type map, area statistics by forest types were recomputed.

Timber-volume estimates for mature sawtimber stands were based on cruise data collected during the original survey, adjusted for cutting and other depletion that had occurred during the interval between inventories. When available, new cruises were substituted. Volume estimates for immature stands were recomputed from yield tables adjusted for revised site, age, and stand-density data.

Second Reinventory

In the second reinventory, in 1956, the forest type map was again completely revised. This revision was accomplished through interpretation, classification, and field mapping on aerial photos covering all of the land area. In the mapping on aerial photos, types whose classification was difficult were examined more closely in the field. Likewise, species composition of mixed stands was checked on the ground. The use of aerial photos in mapping resulted in type delineations of much greater accuracy and detail than were possible through the ground reconnaissance employed in the initial inventory and first reinventory. In preparing the revised type map, delineations on the aerial photos were transferred to a 2-inch county base map through use of a photo projector. The new type map was then superimposed over a current ownership map of complete county coverage and a dot count made of forest type areas by ownership class.

Volume estimates of live sawtimber, growing stock, and salvable dead material were calculated by applying average per-acre volumes to the appropriate forest type acreages. The average per-acre volumes for sawtimber stands and poletimber stands were obtained through a sampling procedure in which the stands were measured on a large number of randomly selected plots. In the random selection of samples, each individual sawtimber or poletimber stand in the county had an equal chance of being selected. A sample consisted of a cluster of three one-fifth-acre circular plots spaced at regular 6-chain intervals. Intensity of the sampling was designed to produce a total estimate of volume in the county of a specified sampling accuracy set by Forest Survey.

Average per-acre volumes of sawtimber and poletimber trees in the overstory of seedling and sapling stands and on nonstocked areas were obtained through an aerial photo plot-sampling procedure. A large number of 1-acre photo plots was taken in a modified systematic-random pattern. By photo interpretation, estimates were made of average number of trees per acre of both sawtimber and poletimber size, average crown diameter, and total tree height. Gross volume of the average tree was obtained from photo volume tables and then adjusted for defect and breakage in order to obtain net volume.

ACCURACY OF DATA

Forest Area

In the second reinventory of the forests of the county, in-place mapping of the forests and their classification by forest type, stand-size class, or condition class were done on the basis of 100-percent coverage. Thus no sampling error was involved. Errors due to techniques or judgment in the field and in office computation of data were possible, but difficult to evaluate. Throughout all phases of the work, close supervision and frequent checks assured a high level of accuracy and uniformity of standards.

Timber Volume

For the live sawtimber volume, derived from sampling surveys, the chances are about 19 out of 20 that a 100-percent cruise, using the same specifications for tree size and merchantability, would be within plus or minus 4.6 percent of the reinventory's estimated total of 97,010 million board-feet, log scale, Scribner rule. On the same basis, the cubic-foot volume of growing stock from a 100-percent cruise would be within a range of plus or minus 3.8 percent. The volume estimates by species, stand-size class, or other subdivision have greater sampling errors than the county-total timber volume.

DIFFERENCES IN RESULTS OF INVENTORIES

Some of the differences in forest-type and timber-volume statistics resulting from the initial inventory and first reinventory, and those resulting from the second reinventory are due to actual physical change such as cutting of stands, restocking of deforested

areas, and ingrowth of stands into the next larger size class. Other differences are due to variations between inventories in the procedures used in interpretation and classification of forest conditions and in standards of utilization. Differences such as these preclude direct comparison of some of the statistics; comparison of other statistics is meaningful only after they have been adjusted to common standards.

Forest Area

Forest-land area statistics resulting from the three inventories, classified by stand-size and condition classes, are shown in table 27. With the exception of seedling and sapling stands and nonstocked areas, the acreages shown for a given class are on a comparable basis as far as specifications are concerned. For example, sawtimber and poletimber acreages for 1932 and 1942 have been adjusted to 1956 specifications. This means that all sawtimber stands are comprised of trees 11 inches d.b.h. and larger, and all poletimber stands include trees 5.0-10.9 inches d.b.h. The seedling and sapling acreages for all three inventories include stands of trees 0-4.9 inches d.b.h., but those for 1932 and 1942 do not include stands on areas clear cut during the previous 10 years that may have been restocked at the time of the inventory; such land was included in the nonstocked class. The 1956 acreage does include areas of land cut in the previous 10 years if they were stocked with seedlings and saplings at the time of reinventory.

This difference in classification procedure had a corresponding effect on the acreages of nonstocked areas. That is, the 1932 and 1942 acreages included all recently clear-cut land (cut in the previous 10 years) regardless of status of restocking at the time of inventory, whereas the 1956 acreage does not include the area clear cut in the last 5 years that had become restocked or had advance growth in 1956. The 1932 nonstocked acreage included 100,000 acres of recent clear-cut land; the 1942 acreage included 123,000 acres. The 1956 inventory found 61,000 acres of recently clear-cut land in a nonstocked condition.

Between 1932 and 1956 there was an increase of 37,000 acres in total area of forest land. There was also a decrease of 65,000 acres in lands in agricultural use. The difference between these two acreages--28,000 acres--is the total area of water in reservoirs behind recently constructed dams, as mapped in 1956. The increase

in forest-land acreage and decrease in agricultural-land acreage was due chiefly to a difference between inventories in classification and mapping of areas of marginal agricultural use, such as cutover land grazed part of the season. The 1932 inventory showed a considerably greater acreage of such land as stump pasture in agricultural use than did the recent inventory. Some acreage of abandoned fields was taken over by encroaching young forests during the 24-year interval; however, this was offset in part by the clearing of forest land for agricultural use.

The increase of 85,000 acres in area of sawtimber between 1932 and 1956 seems large in view of the large-scale cutting operations during the latter half of the 24-year interval. However, a very large part of the 375,000 acres of poletimber in the 1932 inventory had moved into the sawtimber class by 1956. Also, the 1956 sawtimber acreage includes 81,000 acres of partially cut stands, a substantially greater acreage of such stands than was included in the 1932 sawtimber area.

The progression of comparative acreages, from the nonstocked class through the seedling and sapling class, and on into the poletimber class, reflects a normal trend due to restocking of cutover land and the growth of young stands.

Timber Volume

Estimates of sawtimber volume obtained in the three inventories are:

Inventory	Sawtimber volume (Million board-feet)[1/]
1932	71,122
1942	64,481
1956	97,010

1/ Log rule, Scribner

Volume estimates shown for the 1932 and 1942 inventories have been adjusted to the same minimum diameters for a sawtimber tree--at breast height and at merchantable top--as were used in the 1956 inventory. The adjustments also took into account differences between inventories in the volume tables used; in 1956, tables were

used that gave a materially greater volume for a tree of a given size than did tables used in 1932 and 1942. These adjustments reflected in part the change in utilization standards. Another change in utilization, for which no adjustment was made, was the minimum requirement of net sound volume in a sawtimber tree, which was reduced from 33-1/3 to 25 percent of gross volume.

Although it is believed much of the variation in the volume estimates may have been due to differences in survey procedures and techniques, the effects of these differences cannot be evaluated. The 1932 and 1942 estimates were based on private cruises, adjusted to a common standard then prevailing; on ocular estimates of old-growth timber, where no usable cruises were available; and on yield-table volumes for young-growth sawtimber. The procedures employed in making the 1956 estimate are described in the section on FOREST SURVEY PROCEDURE (Second Reinventory), and a calculated sampling error of this estimate is given in the section on ACCURACY OF DATA (Timber Volume). However, no statistical evaluation of the 1932 and 1942 estimates can be made.

Forest growth was a major factor contributing to the volume increase between 1932 and 1956. Both net growth in sawtimber trees and ingrowth of poletimber trees into the sawtimber class contributed to the increase. Conversely, the factors of timber cutting and natural mortality, due to forest insects, diseases, windthrow, and fire, reduced the sawtimber inventory during the interval.

DEFINITION OF TERMS

Land Area

Total Land Area

Includes dry land and unmeandered water surface.

Unmeandered water area. An area of water included as land area in the General Land Office official surveyed land acreage.

Forest Land Area

Includes (a) land which is at least 10-percent stocked by trees of any size and capable of producing timber or other wood products,

or of exerting an influence on the climate or on the water regime; and (b) land from which the trees described in (a) have been removed to less than 10-percent stocking and that has not been developed for other use. Minimum area of forest land recognized in reinventory of the county is 10 acres.

Nonforest Land Area

Land that does not qualify as forest land. Minimum area recognized in the reinventory of the county is 10 acres.

Forest Land Classes

Commercial Forest Land Area

Forest land that is producing, or is physically capable of producing, usable crops of wood, economically available now or prospectively, and that is not withdrawn from timber utilization.

Noncommercial Forest Land Area

Forest land (a) withdrawn from timber utilization through statute, ordinance, or administrative order but that otherwise qualifies as commercial forest land, and (b) incapable of yielding usable wood products (usually sawtimber) because of adverse site conditions, or so physically inaccessible as to be unavailable economically in the foreseeable future.

Types

Forest Land Types

Forest land is typed on the basis of predominant species as indicated by cubic volume for sawtimber and poletimber stands, and number of trees for seedling and sapling stands, or on the basis of forest condition such as nonstocked cutover or burned-over land. Where none of the indicated species comprises 50 percent or more of a given stand, the stand is typed on the basis of plurality of cubic volume or number of trees. In classifying forest land by type, the minimum area recognized is 40 acres.

Commercial Forest Land

Major forest types. Local forest types are grouped into generalized types. The major forest types in Lane County are as follows:

Douglas-fir. Forests in which 50 percent or more of the stand is Douglas-fir.

Hemlock-Sitka spruce. Forests in which 50 percent or more of the stand is hemlock or Sitka spruce.

Ponderosa pine. Forests in which 50 percent or more of the stand is ponderosa pine.

Western white pine. Forests in which 50 percent or more of the stand is western white pine.

Lodgepole pine. Forests in which 50 percent or more of the stand is lodgepole pine.

Fir-spruce. Forests in which 50 percent or more of the stand is true fir or Engelmann spruce.

Hardwoods. Forests in which 50 percent or more of the stand is black cottonwood or other western hardwoods, singly or in combination.

Noncommercial Forest Land

Productive-reserved. Forest land withdrawn from timber utilization through statute, ordinance, or administrative order, but which otherwise qualifies as commercial forest land.

Wilderness area. A wilderness area is an area of at least 100,000 acres characterized by primitive conditions of transportation and habitation. It contains no provision for the passage of motorized transportation, and resorts, organization camps, summer homes, and commercial logging are excluded.

Wild area. A wild area is of the same character as a wilderness area, but is less than 100,000 acres in size, although at least 5,000 acres.

Unproductive. Forest land incapable of yielding usable wood products (usually sawtimber) because of adverse site conditions, or so physically inaccessible as to be unavailable economically in the foreseeable future.

Nonforest Land Types

Vegetative. Cultivated, grass, or brush.

Nonvegetative. Includes barrens, tideflats, and cities.

Unmeandered water (reservoir). See definition under Total Land Area.

Tree Classes

Sawtimber Tree

Tree of commercial species, 11 inches d.b.h. or larger, that contains at least one 16-foot coniferous sawlog or one 8-foot hardwood saw log to a variable top diameter never less than 8 inches inside the bark. Also, 25 percent or more of the gross board-foot volume must be free from rot or defect.

Poletimber Tree

Softwood or hardwood tree 5.0-10.9 inches d.b.h. of commercial species in which 25 percent or more of the gross cubic-foot volume is free from rot and defect.

Seedling and Sapling Trees

Live trees of commercial species less than 5 inches d.b.h. Seedlings must be of good form and vigor.

Cull Tree

Live tree of sawtimber or poletimber size that is unmerchantable, now or prospectively, because of defect, rot, or species.

Sound cull tree. Live tree of sawtimber or poletimber size which contains 25 percent or more of sound volume but will not make at least one merchantable log, now or prospectively, because of roughness or poor form.

Rotten cull tree. Live tree of sawtimber or poletimber size in which less than 25 percent of the total volume is sound.

Salvable Dead Tree

Standing dead or down tree which contains 25 percent or more of sound volume and at least one merchantable 16-foot coniferous or 8-foot hardwood log.

Stand-Size Classes

Sawtimber Stand

Stand of sawtimber trees having a minimum net volume per acre as follows: 5,000 board-feet, log scale, International 1/4-inch rule, in any species except hardwoods; 1,500 board-feet in hardwoods.

Large sawtimber stand. Stand in which the majority of the volume is in trees 21 inches d.b.h. or larger.

Small sawtimber stand. Stand in which the majority of the volume is in trees 11.0-20.9 inches d.b.h.

Uncut Sawtimber Stand

Sawtimber stand that is essentially undisturbed by cutting.

Partially Cut Sawtimber Stand

Sawtimber stand in which a partial harvest has been made, and in which the residual volume amounts to 5,000 board-feet or more per acre for softwoods and 1,500 board-feet for hardwood stands.

Poletimber Stand

Stand failing to meet sawtimber-stand specifications but at least 10-percent stocked with poletimber and larger (5.0" d.b.h. and larger) trees and at least half the minimum stocking in poletimber trees.

Seedling and Sapling Stand

Stand not qualifying as either sawtimber or poletimber stand but having at least 10-percent stocking of trees of commercial species and with at least half the minimum stocking in seedling and sapling trees.

Stocking

Stocking is the extent to which growing space is effectively utilized by present or potential growing-stock trees of commercial species. "Degree of stocking" is synonymous with "percent of growing space occupied" and means the ratio of actual stocking to full stocking for comparable sites and stands. Stocking may be measured in terms of number of trees, volume, basal area, cover canopy, or other criterion or combination of criteria.

Well-stocked stands. Stands that are 70 percent or more stocked with present or potential growing-stock trees.

Medium-stocked stands. Stands that are 40 to 70 percent stocked with present or potential growing-stock trees.

Poorly stocked stands. Stands that are 10 to 40 percent stocked with present or potential growing-stock trees.

Nonstocked areas. Areas that are 0 to 10 percent stocked with present or potential growing-stock trees.

Timber Volume

Live Sawtimber Volume

Net volume in board-feet of live sawtimber trees of commercial species.

Scribner rule. The common board-foot rule used in determining log-scale volume of sawtimber in the Pacific Northwest.

International 1/4-inch rule. The standard board-foot rule adopted nationally by the Forest Service in the presentation of Forest Survey volume statistics.

Growing Stock

Net volume in cubic feet of live sawtimber trees and live poletimber trees from stump to a minimum 4.0-inch top (of central stem) inside bark.

All-Timber Volume

Net volume in cubic feet of live and salvable dead sawtimber trees and poletimber trees of commercial species, and cull trees of all species from stump to a minimum 4.0-inch top inside bark.

Sawlog portion. The part of the bole between stump height and merchantable top that is 40 percent of diameter breast height, but not less than 8 inches diameter inside bark.

Upper stem portion. The part of the bole between merchantable top and a minimum top of 4 inches diameter inside bark.

Tree Species

Tree species commonly found in Lane County include:

Softwoods:
- Douglas-fir (Pseudotsuga menziesii)
- Western hemlock (Tsuga heterophylla)
- Mountain hemlock (Tsuga mertensiana)
- Engelmann spruce (Picea engelmannii)
- Sitka spruce (Picea sitchensis)
- Western redcedar (Thuja plicata)
- Incense-cedar (Libocedrus decurrens)
- Alaska-cedar (Chamaecyparis nootkatensis)
- Western white pine (Pinus monticola)
- Ponderosa pine (Pinus ponderosa)
- Sugar pine (Pinus lambertiana)
- Lodgepole pine (Pinus contorta)
- Pacific silver fir (Abies amabilis)
- Noble fir (Abies procera)
- White fir (Abies concolor)
- Grand fir (Abies grandis)
- Subalpine fir (Abies lasiocarpa)

Hardwoods: Red alder (Alnus rubra)
Bigleaf maple (Acer macrophyllum)
Black cottonwood (Populus trichocarpa)
Oregon white oak (Quercus garryana)
Golden chinkapin (Castanopsis chrysophylla)
Pacific madrone (Arbutus menziesii)

Timber Cut

Annual Cut of Live Sawtimber

The net board-foot volume of live sawtimber trees cut or killed by logging on commercial forest land during a specified year.

Timber products from live sawtimber. The volume of timber products cut from live sawtimber.

Logging residues from live sawtimber. The net board-foot volume of live sawtimber trees cut or killed by logging on commercial forest land and not converted to timber products.

Annual Cut of Growing Stock

The net cubic-foot volume of live sawtimber and poletimber trees cut or killed by logging on commercial forest land during a specified year.

Timber products from growing stock. The volume of timber products cut from growing stock.

Logging residues from growing stock. The net cubic-foot volume of growing stock cut or killed by logging on commercial forest land and not converted to timber products.

Utilization

Salvable Woods Material

Sound wood remaining after logging contained in standing live sound trees, cull or dead trees, in down trees, in broken and cull pieces, and bucked cull logs.

Salvable material specifications. Peeler block--minimum diameter 18 inches d.i.b., minimum length 8 ft. 6 in.; blocks in multiples of minimum length. Species required to be Douglas-fir.

Sawlog--minimum volume 15 board-feet, minimum length 8 feet, minimum diameter 8 inches d.i.b. Larger logs in 2-foot multiples with 6-inch trim allowance.

Pulpwood--minimum d.i.b. 4 inches, minimum length 6 feet, providing at least one cubic-foot in piece.

Cull Log

A log that is less than one-third sound.

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Table 1.--Land area, by major class of land, 1956

Class of land	Area
	Acres
Forest:	
Commercial	2,420,480
Noncommercial:	
Productive-reserved	125,370
Unproductive	29,850
Total	2,575,700
Nonforest	382,570
All classes	2,958,270

Table 2.--Area of young-growth timber stands on commercial forest land, by stocking class, species group, and stand-size class, 1956

Stand-size class and species group	Well stocked	Medium stocked	Poorly stocked	Total
	------- Thousand acres -------			
Large young-growth sawtimber: 1/				
Softwoods	599	13	1	613
Small young-growth sawtimber: 2/				
Softwoods	294	27	1	322
Hardwoods	41	6	3/	47
All species	335	33	1	369
Poletimber:				
Softwoods	160	64	6	230
Hardwoods	19	8	3/	27
All species	179	72	6	257
Seedlings and saplings:				
Softwoods	122	158	60	340
Hardwoods	14	15	4	33
All species	136	173	64	373
All stands	1,249	291	72	1,612

1/ Stands in which the majority of the volume is in trees 21 inches d.b.h. or larger.

2/ Stands in which the majority of the volume is in trees 11.0-20.9 inches d.b.h.

3/ Less than 500 acres.

Table 3. --Area of commercial forest land, by major forest type and stand-size class, 1956

Forest type	Total	Sawtimber stands		Poletimber stands	Seedling & sapling stands	Nonstocked areas
		Large[1]	Small[2]			
	Acres					
Douglas-fir	2,063,600	1,265,170	263,260	203,110	332,060	--
Hemlock-Sitka spruce	24,630	10,460	3,620	4,430	6,120	--
Ponderosa pine	2,290	760	560	740	230	--
Western white pine	1,270	780	480	--	10	--
Lodgepole pine	17,750	--	1,350	15,640	760	--
Fir-spruce	134,480	75,080	52,310	5,960	1,130	--
Hardwoods	106,200	40	46,390	27,250	32,520	--
Nonstocked areas	70,260	--	--	--	--	70,260
Total	2,420,480	1,352,290	367,970	257,130	372,830	70,260

1/ 21 inches d.b.h. and larger.

2/ 11-20.9 inches d.b.h.

Table 4. --Land area by cover type, ownership class, and land-use class, 1956

(In acres)

Cover type and land class	Total unreserved and reserved	Unreserved					Reserved				
		Total	Private	State	Federal: Bureau of Land Mgt.	Federal: National Forest	Total	State	County	Municipal	Federal (National Forest)
PRODUCTIVE FOREST LAND											
	Total	Commercial					Noncommercial productive-reserved				
Douglas-fir, large old-growth sawtimber (yellow fir)	654,140	652,460	161,260	1,370	58,640	431,190	1,680	--	--	--	1,680
Douglas-fir, small old-growth and large young-growth sawtimber (red fir)	626,060	612,630	125,020	7,840	107,140	372,630	13,430	480	--	140	12,810
Douglas-fir, small young-growth sawtimber	271,240	263,130	101,070	1,450	23,070	137,540	8,110	150	170	120	7,670
Douglas-fir, poletimber	203,430	202,960	142,880	6,530	28,320	25,230	470	--	220	--	250
Douglas-fir, seedlings and saplings	332,240	332,040	223,950	5,920	55,650	46,520	200	20	80	--	100
Western hemlock, large sawtimber	6,630	6,590	740	--	150	5,700	40	40	--	--	--
Western hemlock, small sawtimber	1,700	1,700	480	--	250	970	--	--	--	--	--
Western hemlock, poletimber	3,200	3,200	2,110	--	290	800	--	--	--	--	--
Western hemlock, seedlings and saplings	5,670	5,610	4,830	60	270	450	60	60	--	--	--
Sitka spruce, large sawtimber	4,030	3,870	1,570	--	--	2,300	160	120	--	--	40
Sitka spruce, small sawtimber	2,040	1,920	890	--	--	1,030	120	120	--	--	--
Sitka spruce, poletimber	1,270	1,230	970	--	--	260	40	40	--	--	--
Sitka spruce, seedlings and saplings	550	510	360	--	--	150	40	40	--	--	--
Western redcedar, large sawtimber	80	80	20	--	10	50	--	--	--	--	--
Western redcedar, small sawtimber	130	130	70	--	60	--	--	--	--	--	--
Western redcedar, poletimber	150	150	150	--	--	--	--	--	--	--	--
Western redcedar, seedlings and saplings	20	20	20	--	--	--	--	--	--	--	--
White fir, large sawtimber	790	790	--	--	--	790	--	--	--	--	--
White fir, small sawtimber	140	140	--	--	--	140	--	--	--	--	--
True fir-mountain hemlock, large sawtimber	104,070	74,290	450	--	--	73,840	29,780	--	--	--	29,780
True fir-mountain hemlock, small sawtimber	113,740	52,170	300	--	--	51,870	61,570	--	--	--	61,570
True fir-mountain hemlock, poletimber	9,040	5,960	40	--	--	5,920	3,080	--	--	--	3,080
True fir-mountain hemlock, seedlings and saplings	1,640	1,130	50	--	--	1,080	510	--	--	--	510
Ponderosa pine, large sawtimber	760	760	170	--	--	590	--	--	--	--	--
Ponderosa pine, small sawtimber	560	560	540	--	--	20	--	--	--	--	--
Ponderosa pine, poletimber	740	740	740	--	--	--	--	--	--	--	--
Ponderosa pine, seedlings and saplings	230	230	40	--	--	190	--	--	--	--	--
Western white pine, large sawtimber	780	780	--	--	--	780	--	--	--	--	--
Western white pine, small sawtimber	520	480	--	--	--	480	40	--	--	--	40
Western white pine, seedlings and saplings	10	10	--	--	--	10	--	--	--	--	--
Lodgepole pine, small sawtimber	1,350	1,350	930	--	--	420	--	--	--	--	--
Lodgepole pine, poletimber	21,620	15,640	4,380	--	110	11,150	5,980	90	80	--	5,810
Lodgepole pine, seedlings and saplings	760	760	120	--	--	640	--	--	--	--	--
Hardwoods, large sawtimber	40	40	40	--	--	--	--	--	--	--	--
Hardwoods, small sawtimber	46,440	46,390	35,210	310	1,260	9,610	50	--	50	--	--
Hardwoods, poletimber	27,260	27,250	22,330	190	1,860	2,870	10	--	10	--	--
Hardwoods, seedlings and saplings	32,520	32,520	28,270	190	1,320	2,740	--	--	--	--	--
Recent clearcut area, nonstocked	61,350	61,350	37,710	170	6,190	17,280	--	--	--	--	--
Old clearcut area, nonstocked	6,110	6,110	4,810	40	290	970	--	--	--	--	--
Deforested by fire, nonstocked	2,800	2,800	390	10	40	2,360	--	--	--	--	--
Total	2,545,850	2,420,480	902,910	24,080	284,920	1,208,570	125,370	1,160	610	260	123,340
NONCOMMERCIAL UNPRODUCTIVE FOREST LAND											
Subalpine	6,290	80	--	--	--	80	6,210	--	--	--	6,210
Noncommercial, rocky	19,440	15,400	710	--	10	14,680	4,040	70	--	--	3,970
Oak-madrone	4,120	4,120	4,120	--	--	--	--	--	--	--	--
Total	29,850	19,600	4,830	--	10	14,760	10,250	70	--	--	10,180
NONFOREST LAND											
Vegetative land (cultivated, grass, or brush)	301,950	298,300	285,820	70	840	11,570	3,650	70	70	20	3,490
Nonvegetative land (including barrens, tideflats, and cities)	52,310	34,340	24,370	20	1,590	8,360	17,970	50	550	--	17,370
Unmeandered water (reservoirs)	28,310	27,330	21,900	--	60	5,370	980	60	20	--	900
Total	382,570	359,970	332,090	90	2,490	25,300	22,600	180	640	20	21,760
ALL LAND											
Forest land:											
Commercial	2,420,480	2,420,480	902,910	24,080	284,920	1,208,570	--	--	--	--	--
Noncommercial (productive-reserved and unproductive)	155,220	19,600	4,830	--	10	14,760	135,620	1,230	610	260	133,520
Total forest land	2,575,700	2,440,080	907,740	24,080	284,930	1,223,330	135,620	1,230	610	260	133,520
Nonforest land	382,570	359,970	332,090	90	2,490	25,300	22,600	180	640	20	21,760
Total all land	2,958,270	2,800,050	1,239,830	24,170	287,420	1,248,630	158,220	1,410	1,250	280	155,280

Table 5. --Net volume of live sawtimber and growing stock on commercial forest land, by stand-size class, 1956

Stand-size class	Live sawtimber		Growing stock
	Million board-feet, log scale, Scribner rule	Million board-feet, International 1/4-inch rule	Million cubic feet
Sawtimber stands	96,731	103,424	17,184
Poletimber stands	247	282	192
Seedling and sapling stands	30	34	7
Nonstocked areas	2	3	1
Total	97,010	103,743	17,384

Table 6.--Net volume of live sawtimber and growing stock on commercial forest land, by species, 1956

Species	Live sawtimber		Growing stock
	Million board-feet, log scale, Scribner rule	Million board-feet, International 1/4-inch rule	Million cubic feet
Softwoods:			
Douglas-fir	77,402	82,496	13,075
Western hemlock	7,900	8,531	1,558
Mountain hemlock	1,796	1,940	392
Sitka spruce	135	143	25
Engelmann spruce	244	263	41
Western redcedar	2,343	2,483	567
Incense-cedar	396	436	111
Alaska-cedar	1/	1/	2
Western white pine	862	931	206
Ponderosa pine	43	47	12
Sugar pine	417	444	63
Lodgepole pine	39	45	14
Pacific silver fir	1,701	1,838	408
Noble fir	865	934	187
White fir	1,187	1,282	239
Subalpine fir	19	20	10
Total	95,349	101,833	16,910
Hardwoods:			
Red alder	1,093	1,257	281
Bigleaf maple	549	631	160
Black cottonwood	2	3	1/
Oregon white oak	4	4	5
Golden chinkapin	7	8	20
Pacific madrone	6	7	8
Total	1,661	1,910	474
All species	97,010	103,743	17,384

1/ Less than 0.5 million.

Table 7.--Net volume of live sawtimber on commercial forest land, by diameter-class and species group, 1956

(Million board-feet)

Diameter class (inches d.b.h.) and log rule	Total	Douglas-fir	Western hemlock	True firs	Other softwoods	Hardwoods
11.0-20.9:						
Scribner rule	14,834	8,434	2,206	1,384	1,478	1,332
International 1/4-inch rule	16,792	9,784	2,382	1,495	1,600	1,531
21.0-30.9:						
Scribner rule	22,890	16,093	2,979	1,408	2,124	286
International 1/4-inch rule	24,731	17,380	3,217	1,522	2,283	329
31.0-40.9:						
Scribner rule	21,069	17,068	1,942	656	1,368	35
International 1/4-inch rule	22,402	18,092	2,097	708	1,464	41
41.0 and larger:						
Scribner rule	38,217	35,807	773	324	1,305	8
International 1/4-inch rule	39,818	37,240	835	349	1,385	9
All diameter classes:						
Scribner rule	97,010	77,402	7,900	3,772	6,275	1,661
International 1/4-inch rule	103,743	82,496	8,531	4,074	6,732	1,910

Table 8. --Net volume of all timber on commercial forest land, by class of material and species group, 1956

(Million cubic feet)

Class of material	Total	Softwoods	Hardwoods
Growing stock:			
Sawtimber trees:			
Sawlog portion[1/]	15,371	15,059	312
Upper stem portion[2/]	1,157	1,133	24
Total	16,528	16,192	336
Poletimber trees	856	718	138
Total growing stock	17,384	16,910	474
Other material:			
Sound cull trees	54	32	22
Rotten cull trees	81	79	2
Salvable dead trees	541	537	4
Total other material	676	648	28
All timber	18,060	17,558	502

1/ The part of the bole between stump height and merchantable top that is 40 percent of diameter breast height, but not less than 8 inches diameter inside bark.

2/ The part of the bole between merchantable top and a minimum top of 4 inches diameter inside bark.

Table 9.--Volume of salvable material available on areas logged in 1955

Class of material	First-cutting areas		Relogged areas		All areas	
	Mb.m.[1/]	M cu.ft.	Mb.m.[1/]	M cu.ft.	Mb.m.[1/]	M cu.ft.
Sound:						
Peeler block	5,508	692	79,269	10,174	84,777	10,866
Sawlog	170,622	27,394	245,627	37,209	416,249	64,603
Pulpwood	--	22,117	--	17,144	--	39,261
Total	176,130	50,203	324,896	64,527	501,026	114,730
White speck:						
Peeler block	--	--	--	--	--	--
Sawlog	22,348	3,287	1,272	330	23,620	3,617
Pulpwood	--	634	--	1,790	--	2,424
Total	22,348	3,921	1,272	2,120	23,620	6,041

1/ Log scale, Scribner rule.

Table 10.--Volume and weight of product and residue from production of a thousand board-feet of lumber[1/]

Item	Volume	Dry weight	Dry wt. ÷ whole log dry wt.
	Cu. ft.	Tons	Percent
Wood residue:			
Coarse	32.1	0.443	20.4
Fine:			
Sawdust	20.5	0.283	13.0
Shavings	15.0	0.207	9.5
Total	67.6	0.933	42.9
Bark	20.8	0.287	13.2
All residue	88.4	1.220	56.1
Lumber	69.1	0.954	43.9
Whole log	157.5	2.174	100.0

1/ Based on studies by the Oregon Forest Products Laboratory, Oregon State College, and the Pacific Northwest Forest and Range Experiment Station.

Table 11.--Volume and weight of product and residue from production of a thousand square feet of 3/8" plywood[1/]

Item	Solid volume	Dry weight	Dry wt. ÷ whole log dry wt.
	Cu. ft.	Tons	Percent
Cores	3.5	0.049	5.1
Veneer clippings	9.6	0.134	14.0
Roundup, log trim, and spur trim	5.5	0.077	8.0
Dry-end residue	9.6	0.134	14.0
Total	28.2	0.394	41.1
Bark	9.1	0.126	13.2
All residue	37.3	0.520	54.3
Plywood	31.3	0.438	45.7
Whole log	68.6	0.958	100.0

1/ Based on studies by the Oregon Forest Products Laboratory, Oregon State College, and the Pacific Northwest Forest and Range Experiment Station.

Table 12. --Production and disposition of sawmill residue by capacity class of mill, 1955

Residue and disposition	Eight-hour capacity class (Bd. -ft.)[1/]			
	120+ Mb.m. (Lmbr. production of 598 MM b.m.)	80-119 Mb.m. (Lmbr. production of 273 MM b.m.)	40-79 Mb.m. (Lmbr. production of 468 MM b.m.)	0-39 Mb.m. (Lmbr. production of 172 MM b.m.)
	Thousand tons (dry weight)			
Coarse residue:				
Pulp	232	18	19	6
Small items	3	9	8	1
Fuel	238	49	50	10
Unused	104	44	130	56
Total	577	120	207	73
Fine residue:				
Sawdust:				
Agricultural uses	0	0	6	3
Fuel	170	65	61	19
Unused	28	13	65	26
Total	198	78	132	48
Shavings:				
Agricultural uses	0	2	5	2
Fuel	92	41	14	1
Unused	18	10	63	14
Total	110	53	82	17
Bark	172	78	134	49

[1/] Total lumber production, all capacity classes: 1,511 MM b.m.

Table 13.--Production and disposition of residue from veneer and plywood manufacture, 1955

Residue and Disposition	Product	
	Green veneer[1/]	Plywood[2/]
	----- Thousand tons (dry weight) -----	
Cores:		
Pulp	11	--
Lumber	17	--
Fuel	4	--
Unused	3	--
Total	35	--
Green veneer trim:		
Pulp	80	--
Fuel	11	--
Unused	14	--
Total	105	--
Other:		
Roundup, log & spur trim	46	--
Dry-end residue	--	75
Bark	76	--

1/ Resulting from production of 605 MM sq. ft., 3/8-inch basis.

2/ Resulting from production of 599 MM sq. ft., 3/8-inch basis.

Table 14.--Area of commercial forest land, by ownership and stand-size classes, 1956

(Acres)

Ownership class	Total	Saw-timber stands	Pole-timber stands	Seedling & sapling stands	Non-stocked areas
Private	902,910	428,760	173,600	257,640	42,910
State	24,080	10,970	6,720	6,170	220
Federal:					
Bureau of Land Mgt.					
Revested grant lands	277,120	183,920	29,730	57,010	6,460
Public domain	7,800	6,660	850	230	60
National forest	1,208,570	1,089,950	46,230	51,780	20,610
Total Federal	1,493,490	1,280,530	76,810	109,020	27,130
All ownerships	2,420,480	1,720,260	257,130	372,830	70,260

Table 15. --Net volume of live sawtimber and growing stock on commercial forest land, by ownership class, 1956

Ownership class	Sawtimber		Growing stock
	Million bd. -ft. log scale, Scribner rule	Million bd. -ft. International 1/4-inch rule	Million cubic feet
Private	21,373	22,904	3,783
State	616	659	106
Federal:			
Bureau of Land Mgt.			
Revested grant lands	10,521	11,191	1,698
Public domain	326	349	55
National forest	64,174	68,640	11,742
Total Federal	75,021	80,180	13,495
All ownerships	97,010	103,743	17,384

Table 16.--Commercial forest land in private ownership, by type of owner and stand-size class, 1956

Type of owner	Stand-size class				
	Saw-timber	Pole-timber	Seedlings & saplings	Non-stocked	Total
	Thousand acres				
Industrial:					
Large	187	39	81	18	325
Medium	105	14	71	7	197
Small	16	18	19	11	64
Total	308	71	171	36	586
Nonindustrial	121	103	86	7	317
All private	429	174	257	43	903

Table 17.--Production of logs in Lane County, 1925-55

(Million bd.-ft., log scale, Scribner rule)

Year	Logs produced	Year	Logs produced
1925	261	1941	733
1926	291	1942	802
1927	328	1943	960
1928	325	1944	--
1929	453	1945	1,089
1930	299	1946	1,074
1931	207	1947	1,214
1932	160	1948	1,247
1933	223	1949	1,012
1934	226	1950	1,289
1935	317	1951	1,431
1936	417	1952	1,542
1937	448	1953	1,315
1938	403	1954	1,258
1939	575	1955	1,221
1940	614		

Table 18.--Sawmills and lumber production in Lane County, 1925-55[1/]

Year	Sawmills	Lumber production	Year	Sawmills	Lumber production
	Number	Million bd.-ft.		Number	Million bd.-ft.
1925	48	286	1941	100	754
1926	53	345	1942	112	786
1927	46	352	1943	128	879
1928	60	372	1944	133	877
1929	85	479	1945	124	754
1930	74	320	1946	204	955
1931	59	237	1947	225	1,081
1932	43	165	1948	223	1,312
1933	52	227	1949	154	1,214
1934	58	233	1950	157	1,429
1935	59	320	1951	179	1,380
1936	66	428	1952	118	1,464
1937	77	446	1953	117	1,427
1938	71	376	1954	100	1,348
1939	72	546	1955	99	1,493
1940	78	619			

1/ For years 1925-48, "sawmills" and "lumber production" included portable sawmills, if any; for years 1949-55 portable sawmills were not included in statistics.

Table 19.--Number of sawmills by capacity class of mill, and production by degree of manufacture, 1955

Eight-hour capacity class	Saw-mills	Volume of lumber by degree of manufacture: Rough green	Surface green	Rough dry	Surface dry	Total
	Number		Million board-feet[1/]			
Stationary mills:						
120+ M b.m.	11	64	200	1	334	599
80-119 M b.m.	12	24	189	1	65	279
40-79 M b.m.	39	111	329	4	25	469
0-39 M b.m.	37	67	75	1	3	146
Total	99	266	793	7	427	1,493
Portable mills	42	27	--	-	--	27
All mills	141	293	793	7	427	1,520

1/ Lumber tally.

Table 20.--Processing facilities, by capacity class of sawmill, 1955

Eight-hour capacity class	Sawmills	Processing facilities		
		Sawmill only	Planing mill	Dry kiln
	Number			
Stationary mills:				
120+ M b.m.	11	--	11	8
80-119 M b.m.	12	1	11	6
40-79 M b.m.	39	7	32	4
0-39 M b.m.	37	21	16	2
Total	99	29	70	20
Portable mills	42	42	-	-
All mills	141	71	70	20

Table 21.--Source of logs consumed by forest industries in Lane County, by county, 1955

Industry	County						Total
	Lane	Linn	Douglas	Benton	Coos	Polk	
	Million board-feet 1/						
Stationary sawmills:							
120+ M b.m.	460	7	49	-	3	-	519
80-120 M b.m.	187	7	18	-	-	-	212
40-79 M b.m.	343	-	38	1	-	-	382
0-39 M b.m.	110	-	1	-	-	-	111
Total	1,100	14	106	1	3	-	1,224
Portable sawmills:	24	-	-	-	-	-	24
All sawmills	1,124	14	106	1	3	-	1,248
Veneer-plywood	211	1	8	-	7	4	231
Shingle	13	-	2	-	-	-	15
Total	1,348	15	116	1	10	4	1,494

1/ Log scale, Scribner rule.

Table 22. --Source of Lane County logs consumed by forest industries in the county, by ownership class and industry, 1955

Industry	Private					Public	Total
	Industrial			Other	Total		
	Large 50+ M	Medium 5-50 M	Small under 5 M				
	Million board-feet[1/]						
Stationary sawmills:							
120+ Mb.m.	199	66	-	6	271	189	460
80-119 Mb.m.	--	32	18	38	88	99	187
40-79 Mb.m.	8	6	50	146	210	133	343
0-39 Mb.m.	--	--	25	67	92	18	110
Total	207	104	93	257	661	439	1,100
Portable sawmills	--	--	--	24	24	--	24
All sawmills	207	104	93	281	685	439	1,124
Veneer and plywood	11	34	5	53	103	108	211
Shingles	--	--	--	10	10	3	13
All industries	218	138	98	344	798	550	1,348

1/ Log scale, Scribner rule.

Table 23. --Average annual cut of live sawtimber and growing stock on commercial forest land, by species group, 1952-56

Species group	Live sawtimber						Growing stock		
	Timber products	Logging residue	Annual cut[1/]	Timber products	Logging residue	Annual cut[1/]	Timber products	Logging residue	Annual cut[1/]
	Thousand board-feet, log scale, Scribner rule			Thousand board-feet, International 1/4-inch rule			Thousand cubic feet		
Softwoods	1,018,305	99,387	1,117,692	1,094,678	106,841	1,201,519	173,476	17,469	190,945
Hardwoods	7,695	751	8,446	8,849	864	9,713	1,558	157	1,715
Total	1,026,000	100,138	1,126,138	1,103,527	107,705	1,211,232	175,034	17,626	192,660

1/ Annual cut is the sum of timber products and logging residue.

Table 24.--Employment and payrolls, by major forest industry, 1955

Industry	Average employment	Annual payroll	Average annual wage
	Number	Thousands of dollars	Dollars
Stationary sawmills:			
120+ M b.m.	3,652	17,144	4,694
80-119 M b.m.	1,330	6,724	5,056
40-79 M b.m.	1,599	7,342	4,592
0-39 M b.m.	490	1,963	4,006
Total	7,071	33,173	4,691
Portable sawmills	89	312	3,506
Total sawmills	7,160	33,485	4,677
Veneer and plywood	2,822	14,142	5,011
Shingles, poles, and piling	168	676	4,024
Fiber products, remanufacturing and millwork	996	4,646	4,665
Logging contractors[1/]	1,851	9,047	4,888
Total Industry	12,997	61,996	4,770

1/ Data on company-employed loggers are included under the manufacturing category of their company.

Source: State Unemployment Compensation Commission except for fiber-products data, which were obtained through courtesy of the companies involved.

Table 25. --Comparative flow data for streams in Lane County, to October 1, 1950

Stream and gage location	Drainage area	Years of Record	Maximum flow	Minimum flow	Average minimum flow July-Sept. 1941-1950	Average discharge	Average annual runoff
	Square miles	Number	Cubic feet per second				M acre-feet
Blue River, near Blue River	75	15	13,300	13	31	370	268
Coast Fork, Willamette River							
At London	69	15	8,800	10	20	193	139
Near Cottage Grove	104	11	3,340	0	38	263	190
At Saginaw	529	24	32,900	7	101	1,197	865
Coyote Creek, near Crow	94	10	9,260	0	1	168	122
Fall Creek							
Above Winberry Creek near Lowell	131	8	12,700	14	-	-	-
Below " " " Fall Creek	190	15	22,500	19	48	539	390
Hills Creek, near Oakridge	59	8	4,300	12	-	-	-
Lake Creek, at Triangle Lake	50	19	4,180	3	14	204	147
Little Fall Creek, near Fall Creek	48	10	5,000	10	-	-	-
Long Tom River							
Near Noti	88	15	4,930	7	18	228	165
Below Fern Ridge Reservoir	252	11	4,500	0	-	498	360
At Smithfield	263	4	11,500	0	-	-	-
McKenzie River							
At Clear Lake	101	2	2,320	165	-	-	-
At McKenzie Bridge	345	34	18,000	1,805	1,122	1,608	1,162
Near Vida	930	26	64,400	1,260	1,802	3,738	2,701
Near Springfield	1,100	9	43,500	535	-	-	-
Middle Fork, Willamette River							
Above Salt Creek	392	16	34,000	201	394	1,060	766
At Eula	941	26	65,200	450	781	2,527	1,826
At Jasper	1,310	9	122,000	610	-	-	-
Mill Creek, at Wendling	23	1	805	3	-	-	-
Mohawk River, near Springfield	180	15	8,600	11	36	526	380
Mosby Creek, near Cottage Grove	96	9	6,020	6	11	-	-
North Fork of Middle Fork, Willamette River, near Oakridge	246	15	17,000	26	164	747	540
Row River, near Dorena	211	15	19,600	12	40	560	405
Salmon Creek, near Oakridge	117	17	8,040	63	153	385	278
Salt Creek, near Oakridge	113	18	4,320	55	123	286	207
Siuslaw River, above Wildcat Creek							
At Austa	-	9	12,900	20	-	-	-
Waldo Lake, near Oakridge	30	14	144	0	11	29	7
Willamette River							
At Springfield	2,030	32	140,000	500	1,002	5,096	3,682
At Eugene	2,035	9	73,300	500	-	-	-
At Harrisburg	3,420	6	210,000	1,990	-	-	-

Source: Water Resources Committee, report submitted to 48th Oregon Legislative Assembly, January 1955.

Table 26. --Lane County Water Rights, by major stream

(Cubic feet per second)

Stream	Consumptive water use					Nonconsumptive water use				
	Irrigation	Industrial	Municipal	Domestic	Livestock	Power	Fish	Recreation	Ponds	Mining
Brumbough	10	-	-	-	-	-	-	-	3	-
Coast Fork Willamette	34	18	9	1	-	47	1	-	1	-
Fall Creek	5	-	-	-	-	-	-	-	-	-
Long Tom	74	13	-	2	-	2	1	-	23	-
McKenzie[1/]	1,469	81	125	18	-	229	55	-	-	-
Middle Fork Willamette	15	69	20	1	-	2,001	9	-	3	-
Mohawk	18	4	-	1	-	-	1	-	1	1
Muddy Creek	1	-	-	-	1	-	-	-	-	-
North Fork of Middle Fork Willamette	1	1	-	1	-	243	-	-	9	-
Row River	8	2	14	-	-	9	-	-	8	18
Salt Creek	-	19	-	1	-	70	-	1	-	-
South Fork of Middle Fork Willamette	1	1	-	-	-	1	82	-	105	-
Willamette	9	-	-	-	-	-	-	-	-	-
Total	1,645	208	168	25	1	2,602	149	1	153	19

1/ Muddy Creek Irrigation Project has a permit to divert 1,064 cubic feet per second from the McKenzie River.

Source: Oregon State Water Resource Board, correspondence of April 17, 1957.

Table 27. --Comparison of forest area statistics; initial inventory and reinventories of Lane County

Date of inventory	Total forest land	Commercial forest land					Noncommercial forest land
		Total	Sawtimber	Poletimber	Seedlings and saplings	Nonstocked area	
	Thousands of acres						
1932	2,539	2,492	1,750	375	155	212	47
1942	2,555	2,513	1,662	435	226	190	42
1956	2,576	2,546	1,835	267	374	70	30

Table 28. --Average converting-factor ratios for board- and cubic-foot measures of timber volume

Diameter class (Inches d.b.h.)	Board-foot Int'l 1/4-inch rule to Scribner rule	Board-foot Scribner rule to cubic feet
11.0-20.9	1.132	4.307
21.0-30.9	1.080	5.603
31.0-40.9	1.063	6.278
41.0 and larger	1.042	6.772
Average[1/]	1.069	5.869

1/ Weighted by volume.

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